American Machinist
MARCH 25, 1936

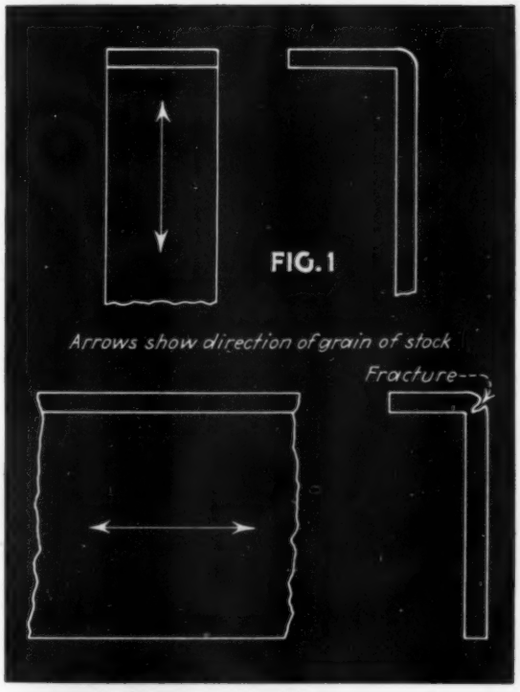


Fig. 1—Selection of the proper direction of the stock will avoid cracking of hard-rolled strips

DIE DESIGN *and* MAKING

E. G. MARSHALL
Master Mechanic, Charleston Works
The American Fork & Hoe Company

1—This article is the first of a series; each installment, while complete in itself, will form part of a well-rounded account of sheet-metal tooling practice

SUCCESSFUL die operation depends on two people, the die designer and the die maker. If both have a fundamental knowledge of the subject they can successfully cope with the numberless dies and different combinations of operations that are met in practice. For these reasons:

The die designer should:

Always study the part thoroughly, its use in the machine or assembly and its manufacturing operations in consecutive order. Then design as simple and economical a die as possible. The volume and quantity of the finished part determine the amount to be spent on the tools.

Lay out the part in red, and develop the die around it from the center outwards. If the die design work is started from the outside, the part may have to be changed because of some unforeseen development. For example, the die block on a mounted piercing die is usually simple and can be made small. But when designing the upper member, in order to get in all the screws, dowels and stripper springs, it will be necessary to change the size of the die block so that it is as large as the stripper.

The die maker should:

Study the tool drawing and the part drawing. If anything is not clear, see the designer or the foreman before starting work. For a blank die, finish and harden the die block and shear the punch into it. Then make the punch enough smaller to give clearance to suit the thickness of the stock. Be careful not to bellmouth the blanking or piercing holes in the die block. Start the taper either at the top of the die block or from a point $\frac{1}{8}$ in. below the top. Allow for lapping and for a drive fit in the dowel holes. Tap all holes in tool steel parts that are later hardened with a tap 0.003 in. oversize to take care of shrinkage and distortion. Always keep the part drawing in mind, because the tool drawing is usually made only to help the die maker who is responsible for a die that will turn out the part within the blueprint limits.

So much for general instructions.

The practices that follow have to do with specific phases of either die design or die making. The grain runs lengthwise of the strip in cold-rolled steel, brass, copper and other metals. Some tempers of cold-rolled steel will take a sharp right-angle bend across the grain, but will fracture if the bend is parallel to the grain as in Fig. 1. If in doubt the following data will give the grade of the steel. Hard-temper cold-rolled steel should take a sharp bend across the grain, but will fracture if bent parallel with the grain. Half-hard will take a sharp right-angle bend either across or parallel with the grain. One-quarter hard should fold back on itself across the grain. Soft grade should fold back on itself either way. A radius at the corner will help to avoid fracture. If possible make the radius equal to the stock thickness or larger. Dead soft stock is used for drawing. For deep drawing steel it is best to consult the steel companies for the correct steel. For especially difficult jobs the mills will sometimes roll a special dead soft grade by what is called "skin rolling."

When laying out a blank with forms in it, consider the angle of the forms with relation to the grain of the stock. Consideration must be given in selecting the stock as to how it will take the forms. When there are two right-angle forms at right angles to each other, lay out the forms as near 45 deg. to the grain of the stock as possible. See Fig. 2. Avoid having forms at an angle of less than 30 deg. to the grain of the stock. For parts with low production quotas the forms can be favored in the layout. The stock waste, although large on each piece, is small compared to the expense for a more costly tool. The reverse holds true for high-production parts. An unusually large scrap per piece would run into money on 100,000 parts. The closest point between blanks or between the edge of the strip and the blank opening should not be less than the stock thickness. From one to two times the stock thickness is recommended. Except in special cases, nothing is gained by allowing more than twice the stock thickness. The general method in use is shown at *A* in Fig. 2. In the case of material less than $\frac{1}{8}$ in. in thickness it is best not to use an allowance at *A* of less than $\frac{1}{8}$ in.

Before laying out a blanking die, analyze the shape and use of the finished part. Check where it fits and its action in the assembly, and the work it has to do. The load put upon it influences the kind of material used, just as much as subsequent operations such as drawing, bending, forming and extruding. Consideration should be given to the fact that cold-rolled steel will not draw as well as dead-soft material; also to laying out the blank in relation to the grain of the stock; and finally to put the burr on a given side, not either side, in order to reduce friction and to prevent tearing during forming.

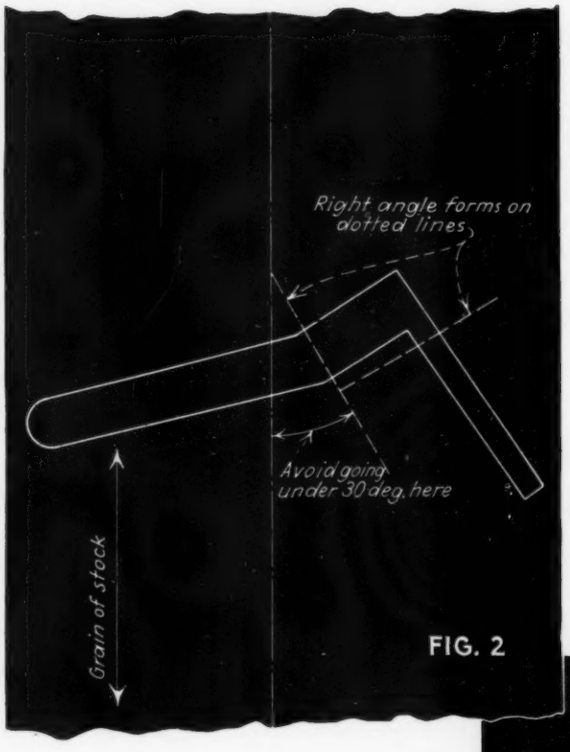
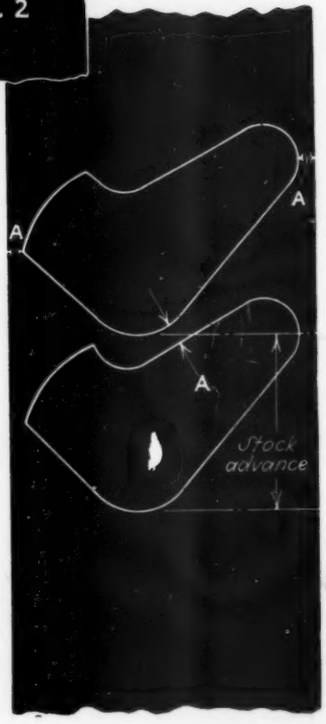


Fig. 2 — Formed parts should be laid out so that the forms are at an angle to the grain of the stock

When developing the blank for a draw die make two or more at a time. Keep one for a sample and try the others in the draw die. Each time a new shape is made, always save one blank for a templet. When a hand-made blank comes out of the draw die to the desired size and shape, lay out the blank die from the one saved as a templet. The same method is advised for use in developing blanks for a swage die, but in this case the thickness of the templet may be changed as well as the shape.

Before designing the die, the shear stress or tonnage required should be calculated. The size of the die and the sub-press are regulated by the area and tonnage of the blank. Be careful not to design die components that are too weak. The greatest danger lies in too small a cross-sectional area from the opening to the edge of the die. Remember that the hole in the bolster may be much larger than the blank opening in the die, so that much of the sub-press will be unsupported. It is always better to use too much material than to have a breakage. The making of a new die block would be worth a lot of tool steel.



When the tonnage is heavy, it is desirable to protect the press and the tools by grinding shear on the punch or the die block, as in Fig. 3. Thus, the tools are caused to cut part of the outline at a time, instead of all at once. When the shear is on the die block, the blank will be flat and the scrap bent. But when the shear is on the punch, the part remaining in the die will be flat and the slug will be bent.

It is important to know on which side of the blank the burr will be. With a blank die the burr is toward the punch. The blank will be flatter if the pierce and blank burrs are on the same side. When the blank is operated upon by one blank die and one pierce die, the burrs can be made to be on the same side. They are on the same side with a compound die. In a progressive die they are on opposite sides.

A special case arises when a new tool order is issued on an old part; that is, a part that has been tooled up, and the new order is for a replacement. In this case, the old tools should be taken from storage and checked to see that all operations are complete and to locate the position of the burr. This must be done before starting the design of the new tool.

It is best to plan the design so that the burr will be toward the punch in the form die. The sharp edge of the burr will wear grooves in the form die block, whereas in any case it does not rub over the punch and cannot hurt it. Where placing the burr toward the die cannot be avoided, put easily replaced inserts in the die at the wearing points.

When the part has an extruded portion on one side, it is best to put the burr on the same side. This should be done because it is easier to make the die to extrude down than up. In most cases, some piercing is done in the extrusion die. The pierce burr will be down, and if this is kept in mind the blank die can be designed so that the burrs from both operations will be on the same side of the part.

If there is no other factor that governs the placement of the burr, a countersunk hole will decide the question. If the burr is on the same side as the countersink, the latter will cut away the break in the hole. This will leave a good thickness of metal at the hole.

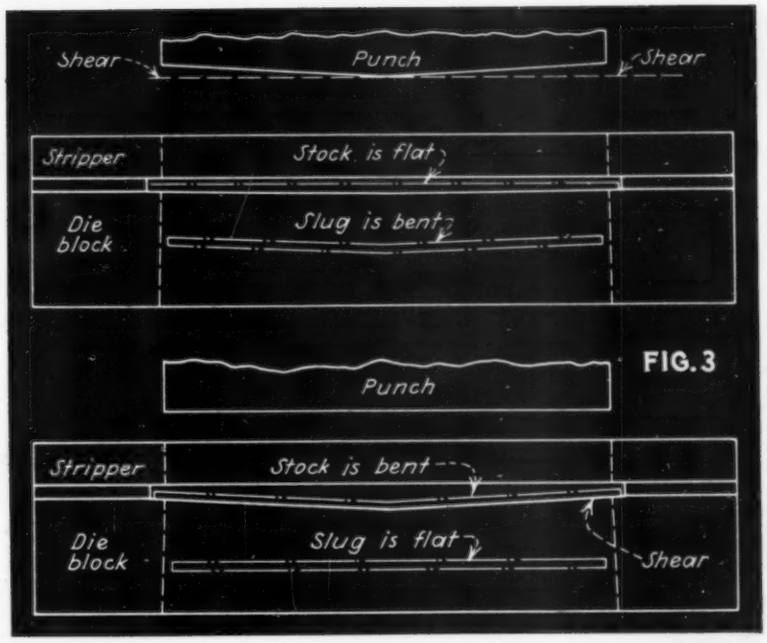


FIG. 3

Fig. 3—By grinding shear on the die or the punch, whichever is most suitable to the work in hand, the tonnage for the operation is reduced

In the matter of clearance between the punch and die, the following should be watched. In a blank die the opening in the die block regulates the size of the part, whereas in a pierce die the punch regulates the size. In the case of a blank die, the die should be made first and the punch fitted to it with proper clearance. For a pierce die allow clearance in the hole in the die block and make the punch to size.

The most widely used stock clearance is 5 per cent of the stock thickness. See Fig. 4. This clearance does not cause excessive wear on the die and it does not leave an excessively large burr or break on the part. For pierced holes used as bearings or as working edges around the periphery, the clearance can be reduced to only 0.0002 in. This will leave no break and very little burr, but will cause the die to wear faster. This requires much more accurate fitting and assembling by the die maker and of course the die will cost more. The other extreme of too much clearance will be a large burr and a break almost the full width of the stock. The softer the temper of the metal the more the metal will rush down and leave a larger radius on the top side. It is easier to get a smooth finish on a shave die with medium soft metal than it is with hard metal.

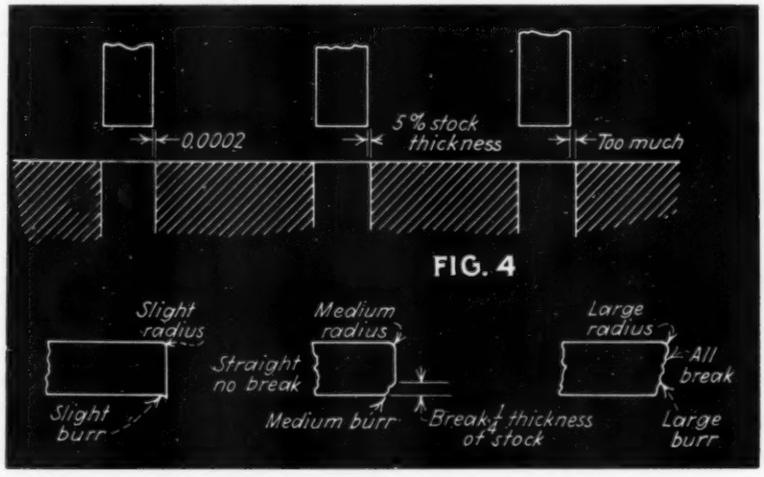


FIG. 4

Fig. 4—Clearance between punch and die is a variable to suit the type of sheared edge required

Templets

In many shops the usual practice is to make a templet to which the blank die is fitted. This practice is more accurate and cheaper as the cost of the templet will be made up in savings on the die. Being of thin, soft stock, the templet can be finished to dimensions faster than the thick tool steel die.

By the following method a templet

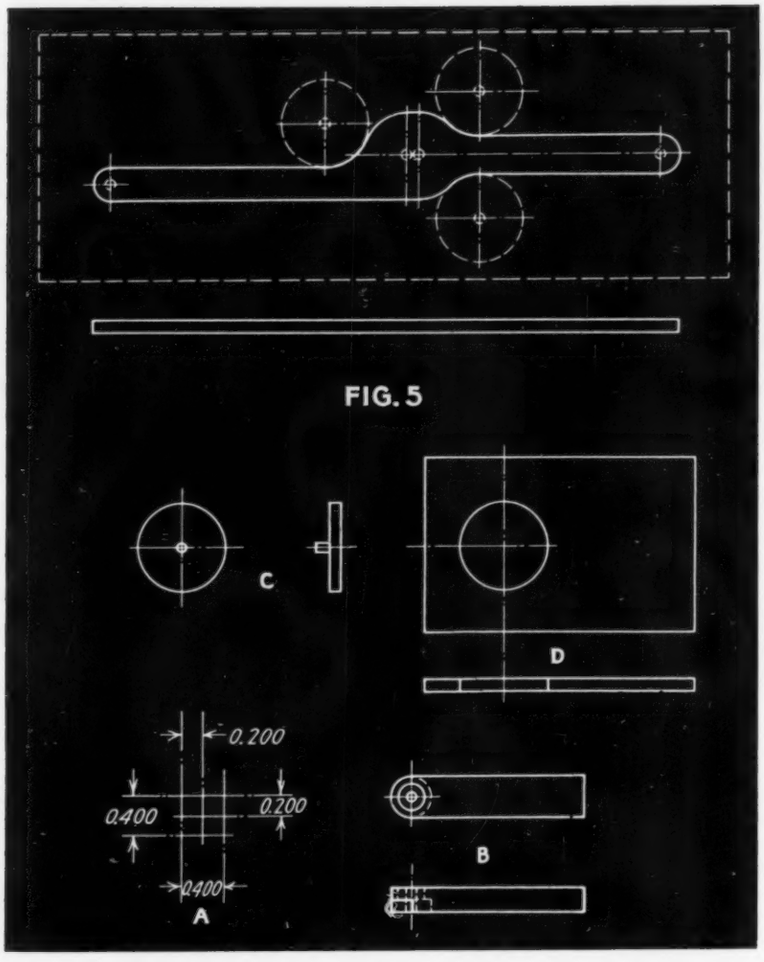


FIG. 5

Fig. 5—Making a templet to diemaker's standards often depends on the use of buttons to locate the radii

can be made satisfactorily. Take a piece of ⅛-in. cold-rolled steel and heat until it turns a purple color. This will show the fine scriber lines much more clearly. Use a sharp scriber so that the lines will be about one or one and one-half thousands wide. If there is a jig boring machine in the shop, bore a small hole in the center of all radii inside the outline of the templet, and bore a hole to size for all radii outside of the templet.

Clamp the plate on a cube block and use a vernier height gage to scribe the straight lines. If there is no jig borer clamp the plate on a cube block and scribe all lines in both directions. Box in the radii centers by scribing a line 0.200 in. from center on all four sides. See *A* in Fig. 5.

For drilling the small center holes make a drill plate as follows: grind a bushing 0.400 outside diameter and the inside diameter to suit. Press this bushing in a bar of cold-rolled steel 0.400 in. wide by ¼ in. thick by 2 in. long. See *B* Fig. 3. Clamp this plate to the templet so that the 0.400 diameter bushing centers the 0.400 in. sq. previously scribed. Drill the small center holes.

Make a button of cold-rolled steel to fit the center hole and with the large diameter to the desired radius. Caseharden the button. See part *C* in Fig. 5. Make a plate *D* with a file to fit the button and caseharden it. Place the button in the correct hole and place the plate over the button. Clamp the plate to the templet and remove the button and file the templet to the inside radius in the plate. Do this on all radii outside the templet.

Make buttons for all convex radii and harden. Place the buttons in the correct center holes and file the radii. A well finished job can be made if the outline is hand filed and then finished with a rotary file in a drill press. Clamp a hardened straight edge to the templet with the edge on the correct side of the scriber line. If the flat side of the scriber was down, clamp the straight edge to the down side of the line and file all of the line away. If the flat side of the scriber was up, clamp the straight edge over the line and file to the edge of the line, but do not file the line away. File to this straight edge and the templet is finished. If the work has been done carefully it will be within 0.001 in. of correct size. For ease in handling the templet in a thick die block, a handle can be attached.

Part II of Die Design and Die Making *will appear in an early number.*

Danger From Welding Fumes

Respiratory hazards may be found in other places than dust-laden atmospheres. There appears to be a likelihood of unsafe conditions in connection with the fumes arising during electric welding. The July 1935 number of *The Journal of Industrial Hygiene* says that excessive metal fume and gas inhalation may be avoided by one or more of several methods:

1. General ventilation of the work place.
2. Local exhaust ventilation with discharge of the fumes and gas outside the work place.
3. The use of respirators containing both adequate filters and gas-absorbing cartridges or canisters.
4. The use of air masks.

It is recommended that the nostrils of welders be examined occasionally before judging the effectiveness of these preventive measures. In welding either iron or galvanized iron, it is believed that fume concentration of less than 10 mg. of ferric oxide or zinc oxide per cubic meter of air will cause no respiratory annoyance and no hazard to the average unprotected person.

Front End Resistance

Locomotive men speak a different language from their automotive brothers when it comes to front end resistance. While the automotive engineer refers to air resistance, the locomotive man thinks of exhaust nozzles inside the front end of the boiler. The larger the nozzle that can be used to produce the necessary draft on the fire, the less the back pressure in the cylinders and the more power available for pulling the train. Front end resistances mean outside contour to the automotive man and inside details to the railway engineer.

CAN MACHINABILITY BE CONTROLLED?

JOHN HAYDOCK
Managing Editor

VARIATIONS in material are irritating and upsetting to shop routine. Any one of the many properties of a given piece of stock may cause trouble, but let us consider for a moment the many headaches in lack of uniform machinability.

Material that is unusually hard to cut may spoil an expensive set of tools; this is especially true of automatic setups, such as in screw machines, where multiple tooling is employed and where the machine does not receive the operator's continuous attention. If tools are ruined more than once, there is a tendency to slow down the machine to favor the exceptionally hard bar, which results in lost efficiency. In such cases a general let-down and failure to make best use of the machine tool is the price of variable machinability.

Where such irregularity occurs in shops that set performance standards, or use wage incentives, the operator suffers through no fault of his own, or else the standards must be adjusted to meet the degree of difficulty in each individual case. Such allowances require supervisory attention and to some extent defeat the purpose of the standards themselves.

Variations do not occur in steel alone but are found in bronzes and other nonferrous metals. Fortunately, with the improved metallurgical processes in mill practice which have been adopted, materials today are better in this respect than they were a few years ago. There is still room for improvement, however, and deviations from the normal are common enough to cause trouble, especially with alloy steels.

Some attempt has been made to establish uniformity through specification—either by the use of a general standard, such as the S.A.E., or by company-drawn specifications. They usually consist of stated chemical constituents, giving a certain tolerance in the percentages called for, and perhaps some limitation as to a standard hardness test, such as Brinnel, Rockwell or Scleroscope. Unfortunately, in many instances, these hardness tests do not serve as good indicators of machinability. In fact there are numerous cases where better machining qualities have been obtained by specifying higher hardness ranges.

Spheroidization, grain size and allotropic structure of the steel may have much to do with the cutting properties of a material without affecting chemical analysis. They may show up on microscopic analysis, but few shops have facilities or time to go into this as a routine test on their general run of material.

SOME concerns that use materials of certain kinds in large quantities have worked out a satisfactory solution with the material suppliers. They use the common form of specification but along with it they have made known their needs as to machinability, and by limiting their purchases to a few mills are able to secure the properties they require. This course of working it out with the supplier may be a practical solution for the large user but does not serve so well for the smaller shop.

Until recently, mills have been extremely reticent concerning machinability of their products. It is gratifying, therefore, to see in some of the newer steel catalogs suggested cutting speeds in feet per minute for various common carbon and alloy steels. These suggestions are no more than the term implies and do not state what kind of machining is considered, how long the tool will last at the speed given or any of the many variables involved in cutting metal. However, the figures given constitute a step in the right direction and serve at least as a basis of comparison between the different grades of steel.

FOR control of machinability several solutions suggest themselves. One is a standard of cutting quality that would set up a definite machining requirement to be met by the material cut. This standard could then be written into the specification as a rigid requirement.

Another way to gain this end would be to include in the specification all the factors considered to influence machinability such as grain size, structure (percentage of pearlite, martensite, etc., depending on the particular steel) and degree of spheroidization.

A third method is for users to continue to work with suppliers toward greater uniformity. Both groups are heartily in favor of avoiding variations, because a uniform product will make life simpler for both. Since the trend is strongly in this direction now, it seems likely that further metallurgical progress will establish practical limits on the variation of cutting qualities. When that day arrives both large and small shops alike will benefit and another cause of manufacturing difficulty will have disappeared.

Uniformity of work material is essential to uniform shop practice. Are more material standards needed or does the answer lie in greater cooperation with material suppliers?

Magnetic tester used to check hardness of balls. This equipment reveals internal defects without injury to the surface of the ball

Sixty-odd inspection operations have aided in setting new standards of precision for Fafnir products

BEARINGS MEET

NECESSITY for high standards of precision in ball-bearing manufacture arises from the internal characteristics of the bearing itself, as well as from the requirements of the assembly in which it is used. From the time of Stribeck's classic bearing investigation almost 40 years ago, it has been recognized that accuracy and balance within the unit are primary factors in assuring dependability and long life. For service reasons alone, therefore, bearing manufacturers have necessarily taken advantage of every advance in precision measurement and test methods, applying them to increase the uniformity of balls and raceways, and to reduce internal clearances as near to the zero point as temperature and load conditions permit.

By applying these same standards of precision to external specifications—diameter, bore, width—the bearing manufacturer has continually anticipated industrial demands for accuracy. Indeed, in many cases, the narrow tolerance limits of bearings recommended for a specific assembly have preceded and instigated increased accuracy of shaft and housing bore, in order that the standards achieved in the bearing would not be cancelled in mounting. In other words, ball-bearing manufacture has to do more than simply "meet" industrial specifications of increasing precision, it adopts new precision standards in order to make a better bearing, and in so doing becomes a forerunner of the standards by which they are specified.

Testing and inspection procedure that has helped to bring tolerances as low as 0.0002-in. into practical application begin with the steel itself while still in billet form. Micro-specimens are prepared from the top, middle and bottom of each heat of steel, and they must meet special limits for non-metallic inclusions in addition to usual specifications for high grade steel. As a check on the mill's own inspection, we make our own tests on the samples cut from ingots before rolling, from the bottom end of each bar rolled from bottom billets, and from both ends of every coil of ball wire.

Inspection of Balls

All balls up to and including ¾-in. diameter are cold-forged; all over ¾-in. hot-forged. This is followed, in the case of the balls, by hardening in automatically controlled gas furnaces. From each heat of balls taken from a furnace, two or more are broken to determine fracture and uniformity of hardness throughout. Hardness is determined by both Rockwell machines and the time-honored file test. If balls pass this test, they are heated and drawn to relieve strains, and a percentage reinspected on round surfaces as a double check for hardness.

Next, the balls are ground to size, tumbled and polished. Test comparators reading to 0.0001-in. are used at each ball-grinding machine, and a constant check is made to assure roundness.

After all finishing operations have been performed, balls are delivered to a final inspection, which checks metallurgical characteristics, surface finish and size. Three balls are taken from each lot, five Rockwell hardness readings are taken on each ball, and then these balls are broken in a Riehle machine for crushing strength. Fractures are also examined and filed. If the crushing strength of any one of these balls falls below our established tolerances, seven more are taken from the same lot and the same procedure followed. If all of these meet our requirements for hardness and crushing strength, the lot is passed; if not, they are rehardened and put through the

An individual motor test of assembled bearings by skilled inspectors reveals the balance and smoothness of operation at high speeds

C. A. COMSTOCK
Chief Inspector, Fafnir Bearing Company

TOMORROW'S LIMITS

grinding and finishing operations again. Of course, these refinished balls will be from 0.001 inch to 0.003 inch smaller and will fall into a smaller size classification.

Balls from 1-in. diameter up are individually checked by a unique electrical testing unit which reveals internal defects and gives an indication of the micro-structure of the steel without injury to the surface of the ball itself. Balls to be tested are simply rotated on two small electrical contacts in the V-shaped notch in front of the operator, and a light beam moving over a ground-glass scale reveals whether or not they come within previously determined standards.

A balance of inductances between three known values and the ball to be tested, similar in principle to the balance of resistances obtained with a Wheatstone bridge, provides the basis of the test. Since the balls have been previously checked for size to within limits of 0.00005 to 0.00001 in., settings are made on the basis of constant mass for each size of ball.

Experiments have shown that internal flaws, soft centers, excessive decarburization and other variations in micro-structure all result in definite changes in the readings obtained. Since hardness also depends upon micro-structure, the measurement gives an indirect check on this factor as well. At present, all balls of 1-in. diameter and larger, where variations due to heat-treatment are more likely to occur, are tested on this equipment. Smaller sizes down to ½-in. are also tested as a check on other inspection methods.

If a lot of balls has passed the above tests, they are then given a visual inspection by operators skilled in detecting pits, rust spots, fine cracks, stains, flat spots and other surface defects. This is a "200 per cent" inspection—in other words, all balls are inspected by one operator, and then completely re-inspected by another. This visual examination is also an additional hardness test, since the brightness of the polish is less in the case of balls falling below our hardness limits. An experienced operator can quickly detect this difference in finish.

In addition, about ten balls of each lot are chosen at random and inspected under a 75X microscope for minute imperfections. These ten balls are also inspected under a four-point minimeter gage for smoothness and roundness. The batch is not passed unless all of these balls meet established standards.

Balls which have met previous tests are now ready for sizing. All sizes up to and including 1 in. are automatically sized between parallels to within 0.00005 in. In other words, a subdivision of ball sizes by 0.00005-in. steps is made to provide balls of utmost uniformity for later assembly in matched units. All balls larger than 1 in. are individually sized by hand. Under minimeter gages, these are within 0.0001 in.

Ring Inspection

The first inspection of rings takes place immediately after forging to check the amount of stock to be removed during the subsequent soft machining. Working in pairs, automatic magazine-feed chuckers machine one face and bore, then the opposite face and outside diameter. Large rings are machined separately, and some of the smaller sizes turned directly from bar stock.

Stock allowed at machining for the grinding operations to follow must be determined within close limits for the size of bearing in process, as it is an important factor in the accuracy of the grinding. Faces and bores must be parallel, and all corners must be care-

Assembled bearings are tested for radial and lateral eccentricity by this triple gage arrangement

fully checked, as there is no removal of stock at the corners. Seal grooves cut during this operation are individually inspected, as there is no further work done on these grooves after soft machining.

Rings which pass visual inspection at this point are then hardened in gas furnaces equipped with automatic temperature control. The inspection following hardening is generally similar to that for the balls: A few rings from each lot are broken, fractures examined and subjected to Rockwell and file hardness tests. The electro-magnetic testing method previously described is equally applicable to rings, and we are now expanding its use to a point where every ring will be given this test.

After hardening, rings are face-ground to width. Most outer rings have an SAE tolerance of standard to minus 0.005 in. Our gages for facing operations are set to standard minus 0.0015 in. It is highly important that these faces be parallel to close limits to assure squareness with diameters and concentric races. This factor is checked on a percentage basis for small rings, and 100 per cent for the larger sizes.

Next comes outside diameter grinding on the outer rings and bore grinding on the inner rings. A 100 per cent inspection for size, as well as squareness and finish, follows this operation. In checking race grinding of the outer rings which is the next step, operators are furnished spacing, race contour and sizing gages, in addition to the automatic electric gages on each machine. A special check for eccentricity of races is also made by floor inspectors.

Finally, the rings received a 100 per cent inspection for size, taper, wheel marks, pits and scants. After polishing, they are washed and oiled and made ready for the matching operation.

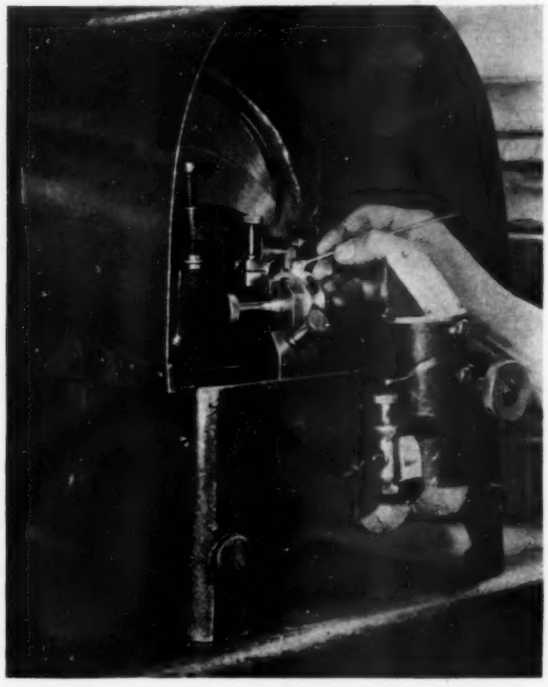
Matching is performed by two methods—bench matching and matching at machines. In bench matching, the outer races are sized to within 0.0001 in. and stacked in piles; all in each pile being exactly one size, the next pile 0.0001 in. over, etc.

Inner Rings Ground to Suit

It is then necessary to grind inner rings to correspond to the various outer rings already sized, allowing for balls and the fit of the bearings desired. Outers, inners and balls in corresponding sub-divisions of size are then brought together for assembly and the balls inserted, followed by a preliminary inspection.

After complete assembly with retainers of the proper specifications, the bearings receive a washing and oiling operation, the oil being forced through the races under pressure.

In the final inspection, all bearings up to and including 80 mm. on radial bearings, and up to and including 2⅞ in. on wide inner rings, are individually mounted in turn on a motor shaft. As the inners revolve at high speed, the trained inspector who holds the outer ring stationary can detect the presence of dirt, nicks in balls or races, lack of balance and retainer adjustment. It is dangerous to test bearings larger than the size mentioned in this way, and hand testing is satisfactory for the larger bearings designed to operate at lower speeds. Eccentricity, outside diameters, bores and widths are also checked 100 per cent



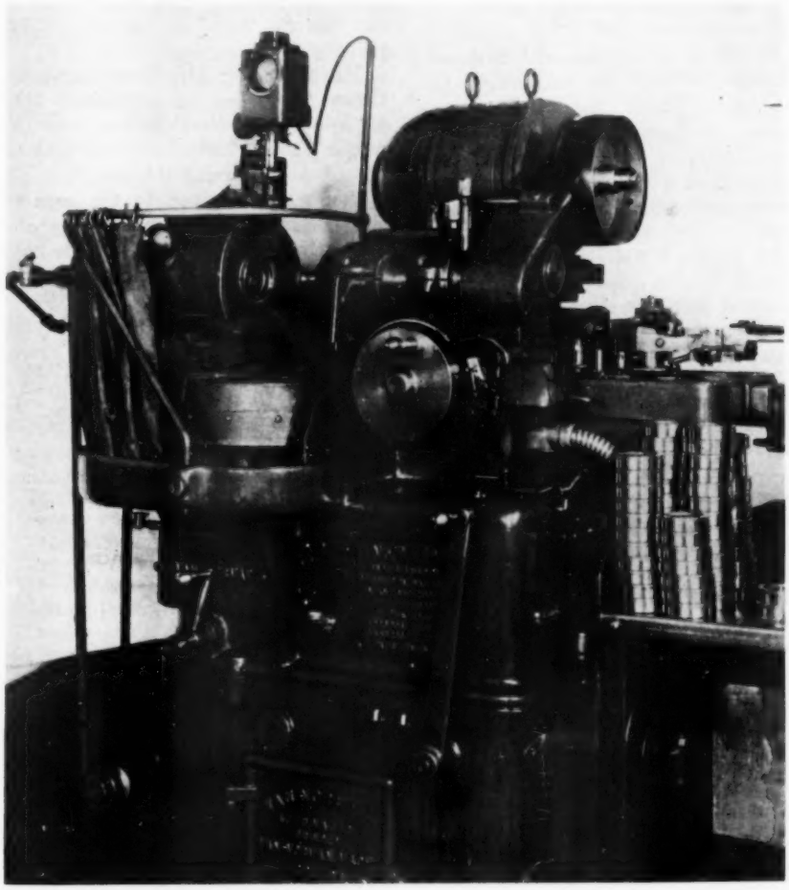
As a check on race contours, this equipment projects a cross-section image of the race, magnified 10 to 15 times, on a ground glass at the rear of the hood. The comparator is used after grinding and polishing, on bearings of all types and sizes

in this final inspection, and a close visual check eliminates bearings with rust spots, pits, scratches and other surface defects. Finally, the bearings are slushed in a mixture of 90 per cent petrolatum and 10 per cent paraffin at 120-130 F., wrapped in glassine paper and sealed in boxes.

In all, each bearing is subjected to more than 60 individual inspection operations, from the time its parts are forged until the final boxing operation. The average labor cost of inspection runs between 20 and 25 per cent of the labor cost of every bearing and in some cases will equal the labor cost. At this writing, there are 230 employees in the inspection department.

Practically all of our gages are basically of our own design and development. Gages such as those used for measuring outside diameters, bores and parallelism of ring faces are so designed that we are able to interchange various makes of indicators and other extremely sensitive measuring instruments to register the correct sizes. Some of these are accurate to within one hundred-thousandths of an inch and the majority to within ten-thousandths of an inch, the latter being approximately thirty times smaller than the average hair.

Although we use several hundred micrometers at the various operations, we do not depend upon these for accurate measuring, the variation in the human touch being so great that we must use more accurate methods where this human touch is not a factor. Therefore, all accurate measuring is done by comparators, these comparators being frequently checked against masters to assure their accurate measurements.



Race grinders equipped with automatic micrometer control provide high accuracy in production

Wooden Models

J. A. POTTER

THE superintendent's office was crowded with foremen.

"All we have are drawings and patterns for these new machines, yet I want finished parts for 500 of them ready for assembly in 90 days," said the superintendent.

There was considerable shifting of feet by the foremen.

"I said 90 days, and furthermore I am not going to listen to shortage of stock, broken down machine tools or similar alibis. You are not going to blame the production and other departments for hold-ups, as I shall expect every man to attend to his own chasing on parts that are assigned to his department. Break a little red tape if necessary, but get out the parts. All foremen are here, so if anyone thinks it can't be done, I am ready to listen to his story."

"There are a good many drop forgings in these machines," said the foreman of the die-sinking job. "I haven't enough men or machines to get out all the dies in time."

"Look up the advertisements in *American Machinist*, Bill. Figure on finishing all the dies you can on your job in 60 days and farm out the ones you can't have ready in that time. That will give you ten days to follow up the outside people. We must have at least twenty days to make the forgings and machine them."

"Forgings are usually hard to hold in the first-operation tools," ventured the head tool designer. "We like to know the position of the flash and the location of the sprue when making the tools. Bill and I usually work out these things together and put added draft on difficult pieces so they can be held to better advantage."

"Now you are asking for lead proofs, but we can't wait until the dies are finished before you start your tools."

"I think I can help him out," said the patternmaker. "Why not let me make white pine models of the forgings that are to be made. The parting lines of the dies can be scribed on the wood to be inked in later, and Bill can mark an oval at the position that seems best for the spruce. These wooden models can then be used by the tool designers and the diemakers."

"That seems to settle the forging question. Plan to get out the jigs first, as jigs take the longest to make. See if you can crowd that new jig borer. I am satisfied that you are all working together. Make a game of it and see who can finish first. Play square and we will be able to deliver the machines on schedule."

First year filing and fitting

APPRENTICE TRAINING in a FRENCH PLANT

Since Hotchkiss apprentices are being trained in a plant that makes machine guns, fine filing and fitting get more attention than they would be likely to get elsewhere

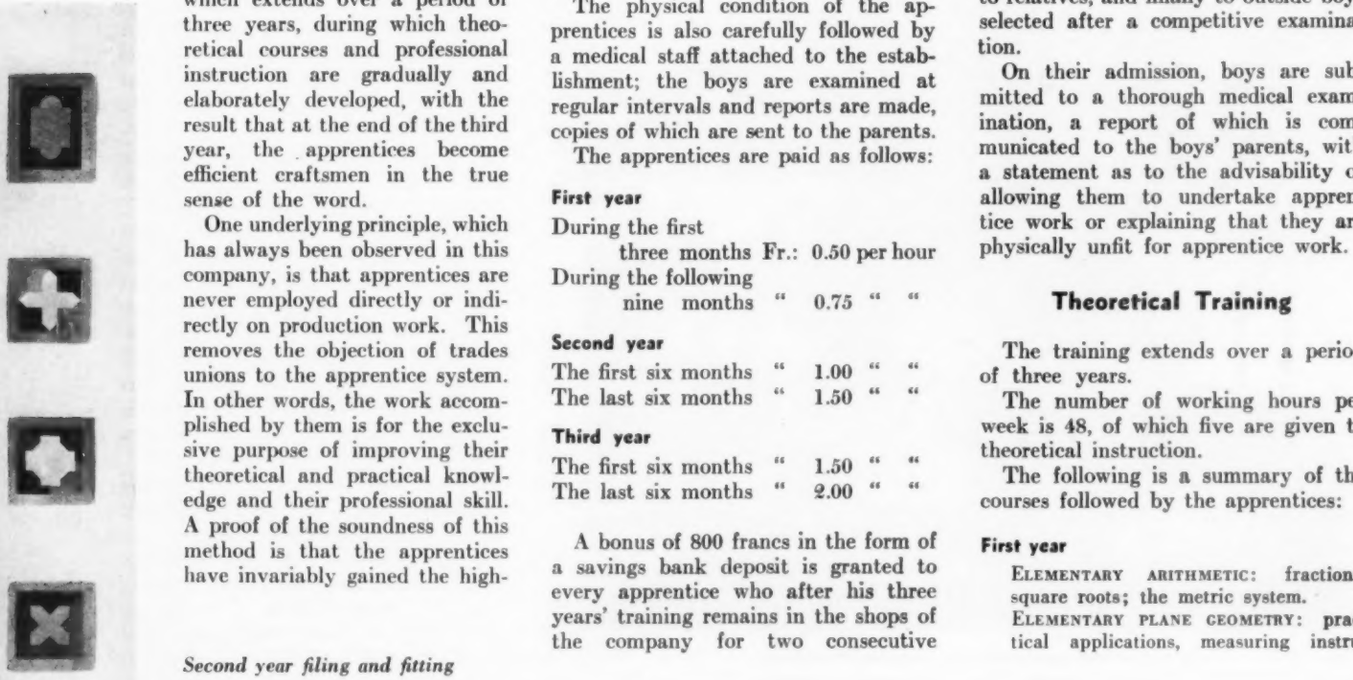
SERGE HÉRANGER

General Manager, Hotchkiss & Company, Levallois-Perret

FOR the last 30 years, the Hotchkiss Company has trained apprentices; the following will show the methods developed after long experience. Training is carried out in one of the principal plants (employing about 2,500 workers) of the Hotchkiss Company, whose specialty for nearly 60 years has been the construction of war material and machine-gun equipment of various types and several calibers.

Apprentices receive a training which extends over a period of three years, during which theoretical courses and professional instruction are gradually and elaborately developed, with the result that at the end of the third year, the apprentices become efficient craftsmen in the true sense of the word.

One underlying principle, which has always been observed in this company, is that apprentices are never employed directly or indirectly on production work. This removes the objection of trades unions to the apprentice system. In other words, the work accomplished by them is for the exclusive purpose of improving their theoretical and practical knowledge and their professional skill. A proof of the soundness of this method is that the apprentices have invariably gained the highest awards in the yearly competitive examinations covering many apprentice training schools, both private and governmental.



Second year filing and fitting

APART from professional instruction, the boys are encouraged to give their leisure time to sports. Teams are organized for various sports, such as football, rowing and swimming, to which the company contributes financially in one form or another.

The physical condition of the apprentices is also carefully followed by a medical staff attached to the establishment; the boys are examined at regular intervals and reports are made, copies of which are sent to the parents.

The apprentices are paid as follows:

First year

During the first three months	Fr.:	0.50	per hour
During the following nine months	"	0.75	" "

Second year

The first six months	"	1.00	" "
The last six months	"	1.50	" "

Third year

The first six months	"	1.50	" "
The last six months	"	2.00	" "

A bonus of 800 francs in the form of a savings bank deposit is granted to every apprentice who after his three years' training remains in the shops of the company for two consecutive years. The apprentice cannot withdraw the money before he becomes of age except with the assent of his parents.

Minimum age: 14. Every boy must show that he has obtained the *Certificat d'Etudes Primaires* from the public schools after an examination passed when leaving the school.

Preference is given to the sons of the working staff of the company and to relatives, and finally to outside boys selected after a competitive examination.

On their admission, boys are submitted to a thorough medical examination, a report of which is communicated to the boys' parents, with a statement as to the advisability of allowing them to undertake apprentice work or explaining that they are physically unfit for apprentice work.

Theoretical Training

The training extends over a period of three years.

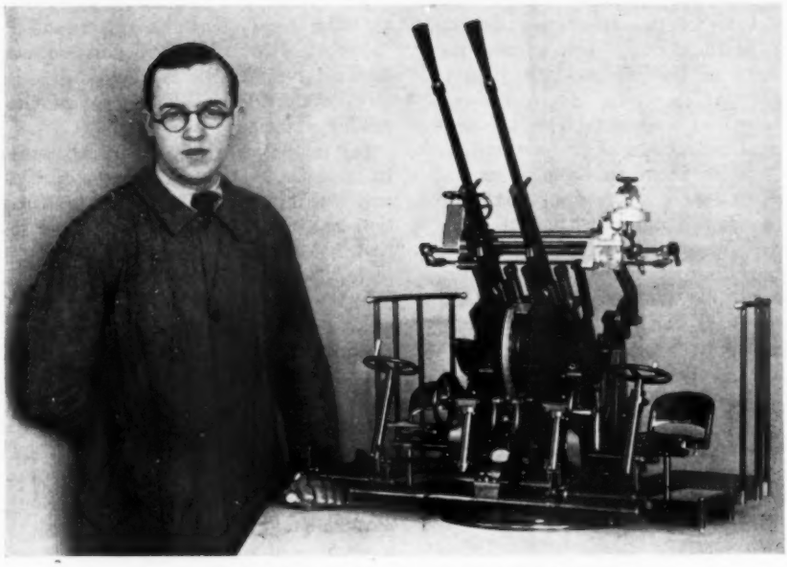
The number of working hours per week is 48, of which five are given to theoretical instruction.

The following is a summary of the courses followed by the apprentices:

First year

ELEMENTARY ARITHMETIC: fractions, square roots; the metric system.

ELEMENTARY PLANE GEOMETRY: practical applications, measuring instru-



During his third year each apprentice makes scale models of the Hotchkiss product. This is 25 mm. anti-aircraft double equipment, scale—1:3, weight—115 lb.

ments; measurement of angles, triangles, polygons, circumference, tangents, etc.

DRAFTING: geometrical drawings, dimensioned drawings of simple mechanical parts, such as: levers, milling cutters, small tools, machine parts; measurement of pieces.

Second year

REVIEW OF ELEMENTARY ARITHMETIC: decimals, ratios and proportions; metric surfaces and volumes.

GEOMETRY: solution of triangles and polygons; proportional dimensions.

ELEMENTARY ALGEBRA: equations of first degree.

DRAFTING: bolts and nuts with various types of threads; machine tool parts, shafting, pulleys, shaft hangers, fly wheels, pinions and gears, worm gears; sketches and drawings.

Third year

ELEMENTARY TRIGONOMETRY: practical applications; lathe and milling machine practice; study of various types of screw threads; triangular, square, acme; their application to machine tools.

STUDY OF THE HELIX: computation of pitch and pitch angles; applications; screws, worm gears, spurs, bevels, pinions and mated gears, helical milling cutters; development of pitch circle and applications for various types of gears; gear cutting on milling machines; study and computation of transmissions by pulleys and gears, simple and multiple; computation of pitch on lathes, milling machines and screw cutting machines; use of milling machine indexing head; helical gear cutting on milling machines; various types of machine tools, their characteristics and operation.

ELEMENTARY METALLURGY: blast furnaces, Bessemer furnaces; study of raw material; pig iron, iron, steel, tool steel, special steels; heat-treatment of steels; physical tests; Brinnel, Rockwell; characteristics of tools; application; lathe tools, milling cutters, turret machine work; time study on machine tools.

DRAFTING: sketches of machine tool parts, assembly drawings.

Professional Training

All apprentices must work on and off for one whole year on file and adjustment work, this being a fundamental training for the eye and the hand. In the course of this period, a selection is made, showing the apprentices who develop special abilities for fitting work, which allows us to classify them as "fitters," and they are trained accordingly. A part of their time is also given to milling work.

The other apprentices become machine operators and are assigned to lathes, milling machines, etc.

At the beginning of the training, each apprentice is given a set of small tools including six assorted files for roughing work, and a certain number of measuring instruments such as vernier, square, calipers, micrometer.

A rough piece of steel is issued to each boy and serves for the first work to be undertaken by him. This piece of steel has to be filed on each face, so as to obtain satisfactory plane surfaces and correct right angles. No time is laid down for this work, although in general two or three weeks are allowed. It is during this preliminary work that instruction is given to the boys on certain fundamental points, such as the proper position of the body with reference to the bench vise, how the file should be held, at what angles, so as to obtain a true plane surface with file cross lines. Also the proper swing of the file strokes.

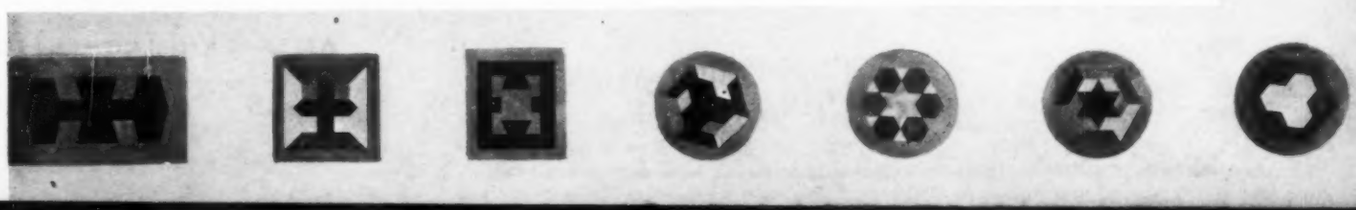
This preliminary work generally presents certain difficulties for the apprentice and needs patience and care on the part of the teacher. After this work is accomplished, a second piece of steel is given to the apprentices and this time dimensions have to be strictly followed, which gives opportunity to the boy to use outside and inside calipers.

For the first few months and according to the progress made by the apprentices the use of small files is prohibited. During this time, no assembly work is given to the apprentice, but solely simple pieces, especially for the purpose of making the boy familiar with the strict observance of dimensions.

It is only after the apprentices become familiar with this work on simple pieces that they are given adjustment and fitting work; first square and rectangular, then dovetail and T adjustments, double-T adjustments, hexagonal, etc. The illustrations give an idea of the work accomplished (with the finest accuracy) and the difficulty of some of the fitting jobs. For this work, a given time is allotted which must be observed with a 10 per cent tolerance.

To begin this adjustment work, the apprentice generally uses the drilling and sawing machines and this gives him the first opportunity to become familiar with drilling. On this occasion, the instructor explains the principles of drill sharpening and the use of the drills for various metals; also how to fix the piece to be drilled, and cautions against the breakage of drills and how to avoid it.

Third year filing and fitting



The complete teaching referred to above obliges the apprentice to work with great precision, to secure perfect adjustment of the surfaces and to observe the very small tolerances to be met, these tolerances being in general plus or minus 0.01 mm.

When the apprentice becomes familiar with the more complicated fitting work, he prepares gages, press tools and the like.

During the third year of training, assembly parts are prepared and complete tools are made: vernier, calipers, shafting and marking gages, angle gages, thickness gages and squares, as illustrated. The various measuring instruments prepared by the apprentices become their property at the end of their training.

Perhaps the most remarkable accomplishments of the third-year apprentices are the scale models, absolutely true in every respect, of the standard machine-gun and semi-automatic-gun equipments manufactured by the company for various governments. The illustration gives an idea of the complexity of this work, which is done entirely by the apprentices themselves.

All this work is done on the machine tools of the apprentice department, without any help from the foundry or the arc-welding department.

The model work completes the professional instruction of the apprentices and enables them to have a general grasp of their profession. It also makes them familiar with such complicated drawings as draw bench, face plate, milling, stamping and die work, gear cutting for bevel, helical and worm gears, adjustment work and assembly.

Milling Work

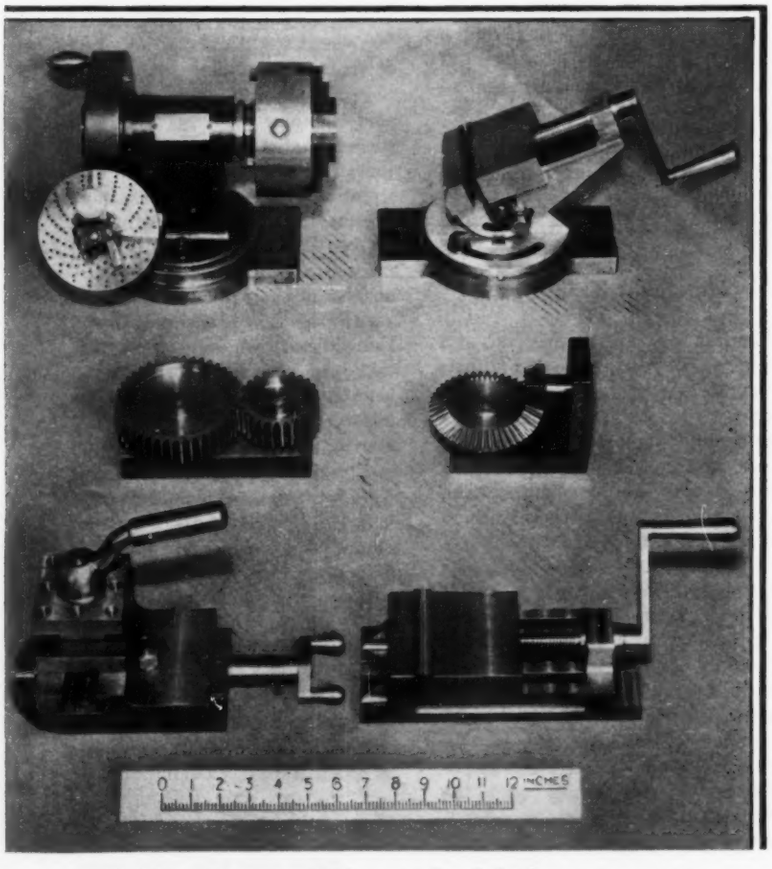
The apprentice begins milling only after the first year spent on filing and adjustment work on the bench vise.

When beginning this work, the apprentice receives thorough instruction regarding various types of milling machines and their component parts. He receives practical training in the use of fixtures and jigs and is instructed on various cutting speeds and feeds, use of the indexing head, and gear milling of various forms of gears.

All apprentices who are to specialize as lathe hands begin this work after the first year. Work begins on an engine lathe and the training is gradually developed, as in the case of the milling machine.

Instruction is given regarding lathe tools and their various characteristics and cutting angles; also full instruction and practice for setting tools in tool holders and adjustment on face plate, beginning from simple cylindrical work to more or less intricate work.

According to one of the rules of the apprentice department, after the conclusion of the three-years' training the apprentices are in no way bound to remain in our plant, but there is not a single exception to the fact that every apprentice, after his training, has requested admission into the shops, as a member of the working staff. These men invariably rank among the best of our working hands.



Machine tool parts made by second and third year apprentices

Reducing Drilling Cost

JONATHAN C. HINTON

In drilling some very tough steel forgings 1½ in. thick, it was necessary to plunge the drill into the body of the work between two projections. These were so close together that the corners of the drill came into contact with them before the point reached the body of the work. With a drill speed of 55 ft. per min. and a feed of 0.012 in. per revolution, the corners of the drill were often damaged before real drilling began.

The first corrective step was to grind the drill with a combination point, using the 118-deg. included angle at the point and 74-deg. angle higher up. This provided a longer point so that the body of the work could be reached to steady the drill before its corners contacted the projections. Production immediately showed an average gain from four to fifteen holes per grind.

Still, it was felt that better results were possible, and to that end a drill grinder was brought into service. It could grind the 118-deg. point but not the upper angle of 74 deg. However, its use caused an immediate improvement and jumped production to 60 holes per grind. The next step was to perform a surgical operation on the grinder to make it grind the 74-deg. included angle. This was accomplished in less than an hour, with the final result that the production from then on averaged 120 holes per grind. The net result was a reduction in cost from $7.00 to 44 cents per thousand holes.

PAUL T. NORTON, JR.
Professor of Industrial Engineering, Virginia Polytechnic Institute

New regulations of the Bureau of Internal Revenue have upset many of the old rules of thumb and forced a realistic attitude toward depreciation of production equipment

REFLECTED in Professor Norton's article is the attitude of the Committee on Depreciation Reserves of the Machinery and Allied Products Institute of which he is a member. This committee is trying to get machinery manufacturers to adopt a more logical depreciation policy in the hope that such a concerted move will:

1. **Automatically assist in the determination of sound costs by removing the fluctuations of one of the variables or uncertainties.**
2. **Tend toward placing a premium rather than a penalty on programs of rehabilitation.**
3. **Increase employment through further mechanization and stabilize employment through well defined replacement programs.**
4. **Promote greater distribution through lower costs and prices.**
5. **Aid the refutation of the theory that technological unemployment is permanently increased by improved mechanical processes.**
6. **Provide a uniformly acceptable basis for costing, for legislative consideration and for tax assessments.**

DEPRECIATION

IN DECEMBER, 1933, a sub-committee of the House Committee on Ways and Means, which was considering revenue legislation, reported that depreciation deductions had been increasing for years, and that for the year 1930, depreciation claimed on the tax returns of taxpayers reporting a net income amounted to 28.2 per cent of the net income before depreciation. (The fact that depreciation claimed was constantly increasing does not in itself show that these claims were excessive, because the increase in the mechanization of our industries would naturally result in an increase in actual depreciation.) The report of the sub-committee stated that, as deductions for depreciation do not represent current cash payments, they could be deferred without injustice to the taxpayers, and recommended that a reduction of 25 per cent be made in all depreciation rates for the years 1934, 1935 and 1936.

The claim that such a temporary reduction in depreciation rates could be made without injustice to the taxpayers, because depreciation is not paid currently in cash, showed a misunderstanding of how and when payments for depreciation are really made. As a matter of fact the entire cost of depreciation is paid out when the asset is purchased. The fact that the cost of the asset is capitalized on the books does not prevent the depreciation of the asset from being really a prepaid expense which should be charged as part of the cost of the future products of the asset. Therefore in the final analysis the increase in the tax that would result from even a temporary reduction of a *correct* depreciation rate would be a tax on an apparent profit that was not in any sense a real profit. This increase in present taxes would really be the prepayment of taxes on expected future profits and if these future profits did not materialize the tax would be to that extent a tax on capital under the guise of a tax on income. (Investigations made by the writer indicate quite clearly that many taxpayers, for any one of several reasons, have failed to charge adequate depreciation on their tax returns or in their costs, thus subjecting themselves voluntarily to the penalty recommended by the House sub-committee.)

It was estimated that a flat reduction of 25 per cent in depreciation rates would increase federal taxes by approximately $85,000,000 per year for the period during which the reduction was in effect. At the tax rate in effect at that time this meant a reduction in total depreciation charges of more than $600,000,000 per year for companies reporting a taxable net income. The Treasury Department strongly opposed the recommendation of the sub-committee and in a letter to the chairman of the Committee on Ways and Means, Secretary Morgenthau stated that the Bureau of Internal Revenue estimated that through proper administration of the existing law an increase in revenue could be obtained which would equal that which would result from the proposal of the sub-committee. The Secretary's letter further stated that "the Bureau proposes to reduce substantially the deductions for depreciation with respect to many taxpayers, so that for the remaining life of the assets depreciation will be in effect reduced to the extent that it may have been excessive in prior years." The Secretary's letter also stated that:

> "It is intended that this end shall be accomplished, first, by requiring taxpayers to furnish the detailed schedules of depreciation (heretofore prepared by the Bureau) containing all the facts necessary to a proper determination of depreciation; second, by specifically requiring that all deduction for depreciation shall be limited to such amounts as may reasonably be considered necessary to recover during the remaining useful life of any depreciable asset the unrecovered basis of the asset; and, third, by amending the Treasury regulations to place the burden of sustaining the deductions squarely upon the taxpayers, so that it will no longer be necessary for the

Bureau to show by clear and convincing evidence that the taxpayer's deductions are unreasonable."

The Committee on Ways and Means decided against the proposed change and the 1934 Revenue Act made no changes in provisions affecting the charging of depreciation. To effect the administrative changes suggested by the Secretary of the Treasury, the Treasury Department issued Treasury Decision 4422, followed shortly thereafter by Internal Revenue Bureau Mimeograph 4170, which states in considerable detail the information which must be furnished and the form in which this information should be prepared. During the two years since the change in the regulations, the Bureau has been doing everything that it could to reduce to a minimum the extra trouble and expense which the taxpayer must now undergo in preparing his depreciation claims. It is possible that certain local representatives of the Bureau may be overzealous in their demands, but it is the writer's opinion that the information now demanded by the Bureau is no more than the taxpayer should expect to prepare for his own use so that his records may show as accurately as possible his actual costs of production. There can be no doubt, however, that the Bureau will do everything that it reasonably can to secure the additional revenue which it estimated it could produce by reducing the depreciation allowance of certain taxpayers, and a taxpayer who cannot show that his claims are reasonable must expect that his depreciation claims will be reduced considerably. The new regulations are by this time familiar to most taxpayers and no attempt will be made in this discussion to describe them in detail, but it does seem desirable to mention one difficulty which many taxpayers will probably encounter in their attempts to maintain their previous depreciation rates. A suggestion will also be offered which may assist in solving this particular part of the problem.

IT IS common knowledge that little manufacturing equipment has been replaced during the last six years. *American Machinist's* 1935 Inventory of Metal-Working Equipment showed that 65 per cent of this country's metal-working machinery was over ten years old. In 1925 the figure was 44 per cent, and in 1930 it was 48 per cent. From the standpoint of ordinary wear and tear it is possible that some of this equipment has been used so little that its originally estimated life may have been extended by the depression, but it is a well known fact that the useful life of modern equipment depends much more upon obsolescence than upon ordinary wear and tear. Even from the standpoint of wear and tear the more modern present machines are probably not in so much better state than machines of the same age would be under normal industrial conditions, because manufacturers have naturally been using their most modern equipment in producing their reduced output in order to obtain the lowest possible costs. The decrease in useful life caused by obsolescence is always very difficult to determine, but there can be no doubt whatever that the developments of the last few years have increased the rate of obsolescence of our predepression equipment.

It seems to the writer that the final proof that our equipment users consider their present equipment to be largely obsolete lies in the fact that so many of these companies have continued their former depreciation rates throughout the depression years, thus indicating that they did not expect that their present equipment would have longer useful lives than had been estimated during the high production predepression years when most of this equipment was installed. (It is true that prior to Treasury Decision 4422 it was considered desirable to adhere to a uniform depreciation rate after it had once been accepted by the Bureau of Internal Revenue, but it is probable that few equipment users felt that they were claiming rates that were unnecessarily high.) Ironically enough the combination of practically no recent replacements and the continued use of predepression depreciation rates will greatly assist the Bureau in securing additional present revenue through decreased depreciation rates, and may also result in increased tax assessments for those past years for which the tax returns are not yet closed.

In order to explain how this may come about, let us take a very much oversimplified case. Suppose that a certain plant used equipment of such a nature that all of the equipment must be replaced at the same time, and also that the useful life was ten years with zero residual value. Also that straight line depreciation was used and that repairs were charged as an operating expense. Under these conditions, at the end of eight years, the ratio of depreciation reserve to first cost would be 0.80. It is also certain that the Bureau of Internal Revenue would approve a 10 per cent depreciation rate for the remaining two years of life, because of the determination to replace the equipment at the end of two more years. But the average plant does not replace its equipment in any such manner. I know of several manufacturing plants which have been operating steadily through the six depression years, with very few machine replacements, and where the ratio of depreciation reserve to first cost of certain assets is around 0.80. What chance has the owner of such a plant of securing the Bureau's approval of a continuance of his former depreciation rate of say 10 per cent? If the original estimate of a ten-year life was correct, the 10 per cent depreciation rate should be continued, because at the end of two more years the equipment will be so much junk as far as useful economic life is concerned.

IN THE case of a manufacturer whose plant is neither expanding nor contracting in size, which has a large number of pieces of equipment, which is old enough to have reached what might be called a state of equilibrium, and provided that there have been no changes in the general price level, it would seem that the ratio of depreciation reserve to first cost should not be much more than 0.50. There are no plants which have the conditions mentioned, but is it surprising that the Bureau is looking with suspicion upon the depreciation rates claimed by companies where the ratio is so greatly in excess of 0.50? There would seem to be just one way for such a company to prove to the Bureau that it should be allowed to continue using fairly high depreciation rates, and that is for the company to prove to the Bureau that it really considers that its present equipment is rapidly approaching the end of its useful life. Apparently the only way that this could possibly be proved to the satisfaction of the Bureau is for the company to enter upon a vigorous program of equipment replacement. If a manufacturer having a high ratio of depreciation reserve to first cost is not willing to begin replacing his equipment, it would seem that one of two things must be true, either his original estimate of the life of his equipment was much too low and his depreciation rate should now be reduced, or else he is willing to continue to use equipment which is obsolete and should be replaced.

Attention will now be directed to what appears to be a rather fundamental change in the attitude of the Bureau of Internal Revenue toward depreciation rates. In the past the Bureau has prepared and published certain depreciation rates as being reasonably applicable under normal conditions for a long list of depreciating

assets. Any considerable change in the depreciation rates claimed by a taxpayer from year to year was almost certain to be questioned by the Bureau, and many taxpayers felt that after the Bureau had once approved a certain depreciation rate, the only safe policy was to continue using this rate in future years.

Under the new regulations there is no reason why the Bureau should not in future allow depreciation rates which change each year. Treasury Decision 4422 states that "the reasonableness of any claim for depreciation shall be determined upon the conditions known to exist at the end of the period for which the return is made." As the depreciation rate depends primarily upon an estimate of the useful life of the asset and as "the conditions known to exist at the end of the period" will usually modify any previous estimate of useful life, it would seem that the depreciation rate should change yearly for each asset. Few taxpayers will actually make each year a careful study of the expected future useful life of each asset and depreciation rates will probably not vary greatly from year to year, but taxpayers should not overlook the fact that so-called standard depreciation rates no longer will be accepted by the Bureau. The new regulations apply to all past years for which tax returns have not been closed and the Bureau is now engaged in assessing additional taxes in the case of certain companies by reducing the depreciation allowances for these past years. Taxpayers who have operated at a loss during the past few years, but who have continued to use the same depreciation rates for the sake of consistency, may find it desirable in some cases to file amended returns for the years still open. In these amended returns the depreciation rates would be reduced to what would have been a fair rate under the conditions known to exist at the end of each period. Such action will defer a certain amount of depreciation which may then be charged in future profitable years. It must be remembered, however, that the law does not permit the charging in future years of depreciation which should have been charged previously under the conditions then known to exist, but which was not charged.

If they mean anything, the new regulations must mean that a reasonable depreciation rate on any individual asset should be determined by conditions affecting that particular asset, regardless of the depreciation rates on any other similar asset. There is no doubt in the mind of the writer that the Bureau will approve almost any depreciation rate that the taxpayer may claim, provided he can show that such a rate is based on a definite replacement policy. The best way to prove to the Bureau that such a policy really exists would seem to be for the taxpayer to actually use the amounts claimed for depreciation in the *replacement* of equipment.

AS STATED previously, the 1934 Revenue Act made no changes that specifically affected depreciation. There was, however, a change in the law which may indirectly prevent certain taxpayers from charging on their tax returns part of the decrease in value of assets which is ordinarily charged as depreciation. It is because the Government recognizes that depreciation is a real cost of production that taxpayers are permitted to deduct depreciation when computing taxable profits. Under the present law taxpayers are not permitted (except for a small annual exemption) to reduce taxable income by deducting capital losses from current profits, and for that reason the decrease in value of an asset must be handled as a cost of production through depreciation if it is to be used at all in computing taxes. This change in the law itself, together with the evident intention of the Bureau of Internal Revenue to scrutinize depreciation charges more carefully than formerly, makes it very important that taxpayers should be sure that their annual depreciation charges are adequate. The Government recognizes the fact that future life cannot be calculated accurately and, in cases of sudden obsolescence, will allow deductions for depreciation which really should have been charged in the past, provided the taxpayer can show that he had charged in previous years all of the depreciation which was reasonable in view of the information which he then had. It is presumed that in cases where the Bureau refuses to allow a taxpayer as high a depreciation rate as the taxpayer believes to be reasonable the Bureau will allow the taxpayer to deduct the additional depreciation if in later years it becomes evident that the higher depreciation rate should have been charged.

With the increased mechanization of our industries, depreciation has become one of the most important items which make up the cost of manufactured articles. The very fact that it is so difficult to determine the exact amount of depreciation makes it all the more important that great care should be exercised in setting depreciation rates and in charging the resulting depreciation against the various products. Otherwise at the end of the useful life of the asset it may be found that insufficient depreciation has been charged, resulting in a real capital loss

RECENT changes in the regulations which govern the charging of depreciation in Federal tax returns have brought the whole depreciation problem forcibly to the attention of all users of assets subject to depreciation. Under the present regulations, if the taxpayer cannot satisfy the Bureau of Internal Revenue that his depreciation rates are reasonable, these rates will be reduced when his return is audited by the Bureau. This will, of course, result in an increase in his taxable net income exactly to the amount of the depreciation which has been disallowed. The avowed purpose of the new regulations is to increase tax revenues by reducing excessive depreciation claims.

SOME taxpayers, finding that their taxable net income has been increased because of a reduction in their allowance for depreciation, may place undue emphasis on the tax aspect of the depreciation problem. This is perhaps natural, because the tax aspect is so tangible, but it should be remembered that the fundamental economic aspect of depreciation is the most important part of the problem, and if this is handled properly the tax part of the problem can usually be taken care of without great difficulty. The primary purpose of this discussion is to consider what depreciation really is and how it should be handled from the standpoint of costs and the value of assests, but the tax side of the problem will first be considered briefly. For the sake of simplicity the discussion will be limited to depreciation as it affects the manufacturing industries.

which might have been avoided if the apparent cost of the product had been increased to include the real depreciation, or in other words, if in this respect these apparent costs had been actual costs.

There are two principal reasons for making depreciation charges; first, to maintain capital intact by reducing the stated value of the asset on the books as depreciation occurs; and second, to charge the decrease in value of the asset into the cost of the products of the asset. It is evident that in cases where the depreciation charges are inadequate the profits shown on the books are merely apparent profits, and also that these apparent profits will exceed the real profits by the amount of the depreciation which was not charged. Dividends may be paid from these apparent profits which really represent a return of capital. Incidentally a Federal tax must be paid on such apparent profits.

The recent changes in the Federal regulations governing depreciation charges have emphasized the fact that depreciation is really an engineering rather than an accounting problem. It is no longer sufficient either for tax purposes or for cost purposes to base depreciation rates on the average life of a large group of assets of widely differing characteristics. Engineers have for years contended that it was ridiculous to combine various assets of quite different characteristics in one depreciation rate, with the expectation that this average rate would be correct and show the true cost of using each asset. Modern industry, through scientific cost accounting methods, does everything possible to remove variables and uncertainties from the cost element. The closer depreciation charges approach the actual depreciation which is occurring, the better will be the chance of attaining the objective just stated. In view of the fact that the same equipment will depreciate at very different rates under different operating conditions, and when used by different industries or even by different companies in the same industry, it does not seem possible to set standard depreciation rates. It is, however, very desirable that the policies under which depreciation rates are set should be uniform throughout the country.

It is sometimes stated that the purpose of depreciation charges is to provide a fund out of which assets may be replaced at the end of their useful life. Strictly speaking this is not the case. Depreciation is for the purpose of taking care of the decrease in value of the present asset and has nothing to do with the possible replecement of the present asset. Depreciation of a present asset is a perfectly definite amount (although it is never possible to compute it exactly until after the asset has been displaced) and it makes no difference whether the present asset is ever replaced at all, or if replaced what the cost of the new asset may be. Nor is the usual "reserve for depreciation" a fund of money at all. The purpose of this reserve is merely to write down the value of the present asset on the books. It is true that manufacturers who are making a profit do receive actual cash from their sales to cover the amount of depreciation which they charge into their costs, but it is seldom that this money is actually maintained as a separate fund for the purpose of future replacements. It is certainly not desirable for a manufacturer to invest money in such a fund at the low rate of interest that can be obtained from conservative investments and at the same time to borrow money at a higher rate of interest. Therefore the cash which represents depreciation charges is ordinarily used somewhere in the business itself.

THOSE who maintain that depreciation charges should be placed in a separate fund, and used only for making replacements, point out that it often happens that there is no money readily available at the time when replacements should be made and that the lack of such a replacement fund often causes the postponement of replacements which are economically desirable and which would have been made if such a fund existed. This is probably true, but in the case of most companies there is still another policy that could be followed that should be more desirable than either investing these funds in good securities or using them elsewhere in the business while waiting for the time when the money will be used in making replacements. The best way to handle this matter would be to replace assets each year to the extent of the depreciation that *actually* occurred during the year. In order to take full advantage of such a policy it would be necessary that the amount of depreciation charged on the books should be equal to the actual depreciation, at least on the average, and not the much smaller amount that is so often used. Replacement each year at a rate equal to the amount of the depreciation which occurred during the year would smooth out the great peaks and valleys in the production of equipment, would enable the machine user to have modern machines in his plant at all times (provided his depreciation charges are adequate) and would obviate the necessity for large special appropriations for making replacements, for which there is always difficulty in getting authority and which are sometimes difficult to finance. Some rather large manufacturers have found from actual experience that a more or less definite plan for regular replacement of equipment is profitable.

There is no connection whatever between depreciation and productive efficiency. A machine which is nearing the end of its useful life may have practically the same efficiency as when it was new; in fact in modern industry it is seldom desirable to retain a machine in use which has lost any considerable amount of its original productive efficiency.

It is only after an asset has been displaced that it is possible to determine accurately the amount of the depreciation that has occurred, and it is then too late to charge any deficiency in our previous depreciation charges into the cost of the products of the asset. The depreciation has nevertheless occurred and it should be charged against the asset that has been displaced and not against any other asset. The fact of the matter is that any difference between the book value and the realizable value of the replaced asset represents additional depreciation which has occurred and which *should have been charged* as a part of the cost of the products of the replaced asset. It is evident that if the actual life and the realizable value had been known at the time the asset was first installed, a depreciation rate would have been set which would have made the book value equal to the realizable value at the time of replacement. So many assets are replaced because of obsolescence that it is not possible to set depreciation rates that will make the book value equal to the realizable value at the time every asset is replaced, but any book loss which has been due to insufficient depreciation of a particular asset should be charged to profit and loss, surplus or to a special replacement fund, which would be a part of the earned surplus of the company but earmarked to prevent its being paid out as dividends. To charge this book loss in any way against the asset which replaces the former asset is just as unthinkable as to charge a loss on some particular manufacturing order to the *cost* of some particular future order. Depreciation charges must be handled realistically, especially in the manufacturing industries, where competition prevents a manufacturer from adding losses due to past errors of any sort to the cost of particular future products.

Acme photo.

If your plant was one of those hit by the rising waters you will want to know how to minimize your loss by putting your equipment back into production without delay or damage

FLOODED OUT

WATER swirled through many an industrial plant last week, suspending operations and leaving havoc in its wake. Pennsylvania and New England were hardest hit, but Ohio, West Virginia, Maryland, and New York also felt the grip of the flood.

As the water recedes, a tremendous job is left to the plant forces in putting the equipment back into running order. The action of the flood has been destructive, and the clean-up job will be expensive. It is a good time, therefore, seriously to consider replacement of those units of plant equipment that are slated to go in the near future. There is little to be gained by spending good money on obsolete machines.

The greater part of the equipment, however, must be restored to production as promptly as possible. In this discussion particular reference will be made to machine tools, but in general, most of the remarks will apply to all plant machinery.

Flood waters always carry abrasive silt. If this is not thoroughly removed, wear will soon destroy the precision of the equipment. The first job then is to remove all silt from the plant with hose, broom and shovel. This preliminary housecleaning job should be done with care, for as the silt dries out it will form dust which may again find its way into the equipment.

The next step is to get the silt out of all moving parts which in most instances means a thorough job of dismantling. In such machines as lathes, planers, boring mills and grinders the safest method is to strip the machine right down to the bed. Small unit subassemblies should be taken apart on a bench and each piece cleaned with gasoline, or better still, dry cleaners' solvent which is non-inflammable. Screws, keys, nuts and other small parts can be put right into a can of the cleaner. Castings and the larger parts can be washed with paint brushes or rags. Special attention must be given to oil holes and oil grooves.

Acme photo.

High water put out the fires at Binghamton in the hardest hit section of New York State

Another machine element requiring extra attention is anti-friction bearings. These, too, should be disassembled if their construction permits, as any grit remaining in them will be highly destructive.

Oil sumps should be drained and cleaned out completely; oil pumps must either be disassembled and washed or flushed out first with solvent and then with oil. After all loose dirt has been removed, the bed of the machine should be gone over with solvent and a paint brush.

In a few cases, where rust has gone below the surface of the metal, a re-scraping job may be in order. Usually this can be avoided, but when essential, it should be carried out so as to preserve or improve the machine alignment. During reassembly of the parts and re-erection of the machine, the methods adhered to in machine tool building must be followed. Metal-working shops unfamiliar with such methods will do well to consult the manufacturers, as otherwise the accuracy of their equipment is almost certain to be impaired.

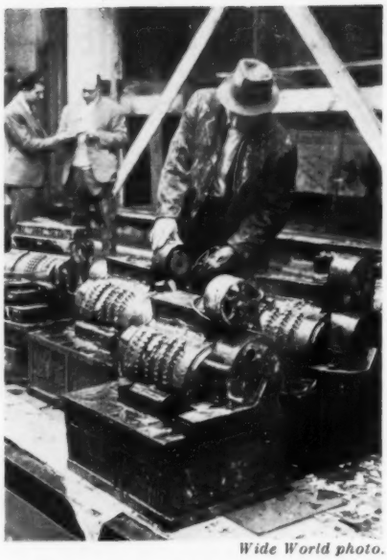
Roller or silent chain should be soaked in solvent or, even better, be run through the solvent by laying it over a revolving sprocket. The motion will tend to dislodge the dirt that collects between the many bearing surfaces. A bath in lubricating oil is advisable before the chain is returned to the machine.

Belts are affected according to the material of which they are made. Rubber belts, provided the fabric is not exposed, are not affected. A good cleaning and drying makes them ready for use. If, however, water has gotten through worn spots in the covering it may be necessary to cut a portion away.

Waterproofed leather belts should give no trouble. Ordinary leather belts will absorb a considerable amount of water, and if waterproof cement has not been used, they will come apart at the lap. Care should be taken not to permit a leather belt to dry too quickly, else it will crack or "burn." After it has been cleaned with cold water (never hot water or steam) both sides should be treated liberally with good belt dressing, neatsfoot or cod oil. Little or no oil will be absorbed by the wet leather, but the protective coating which will form retards evaporation of the moisture. Heat must not be applied; the belt should dry naturally in the open air. As it does the dressing will soak in, and the excess may be wiped off. When dry to the touch the belt can be placed in service. The lap should be examined for ply separation.

Most fabric belts are water proofed, and if this treatment has been good, they will suffer little from immersion. Cleaning and drying will make them ready for service. It is a good idea to check the tension if the belt has been submerged for a considerable time. If moisture has been absorbed it will shrink and tend to strain the shafts and bearings. Replacement is then the safest course.

Very probably the plant's electrical equipment will require the most skillful treatment. After the preliminary rough cleaning, small motors and control equipment had best be sent to the repair shop. Large motors can be dried in place. Silt and adhering grease may be removed with solvent.



Wide World photo.

These cash registers from a Pittsburgh store typify the damage done to thousands of dollars worth of equipment in the flooded area

Small motors may be dried in an oven at not over 185 deg. F. If oven capacity is not available an improvised inclosure may be made of sheet metal; adequate ventilation should be provided. Steam coils, electric units, oil burners or even charcoal may be used for heat.

An insulation resistance test will indicate when the motor is dry. It is advisable, then, to dip the windings in a good insulating varnish and bake.

Apparatus such as compensators and transformers should be treated in a similar way. Oil filled units must be drained and freed from all dirt. Coils may be dried by heating them in an oven or by passing enough current through them to produce a temperature of not over 185 deg. F. Care should be taken to avoid hot spots when windings are heated in this way, as the water may have reduced the insulating resistance unevenly. The interior of the coils will reach a higher temperature than the outside, so it is advisable to use a thermometer to check the rise. Transformer oil must be replaced, or tested after filtering or putting through a centrifugal separator.

By surrounding large motors with inclosures of canvas, wood or sheet metal they may be dried out in place. Heat may be applied from an external source or by passing a low voltage current through the windings. To avoid scorching the insulation or running danger from trapped steam, the temperature must be kept within safe limits. Again, thermometers should be put in use to detect local hot spots.

A GOOD method of drying out synchronous motors is by rotating them slowly with low exciting current and short-circuited terminals. Circuits must be opened and closed only with the motor at a standstill. Another way is to pass a low current through both armature and field with the machine stationary.

In a similar manner, large shunt-wound d.c. motors may be brought back to operating condition by turning over slowly with a short-circuited armature and weak field excitation.

One of the most effective ways of checking the condition of insulation is by the use of resistance tests. The best method is to take repeated readings during the drying operation and to plot a curve showing the progress.

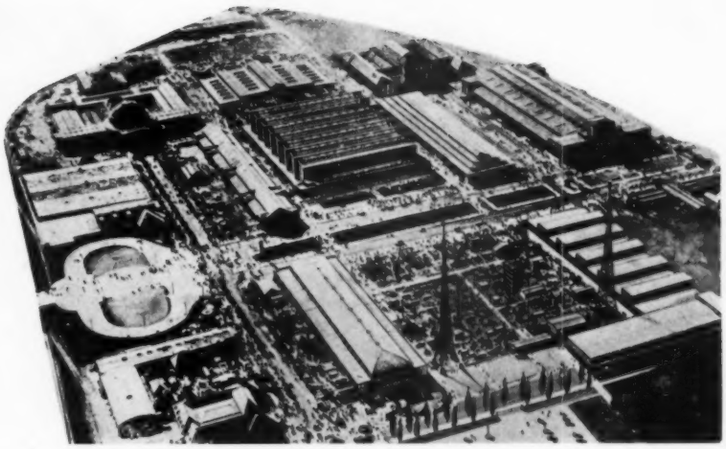
After the initial clean-up and the return of equipment to production, a repainting and sprucing up job is in order. The emergency work is of first importance because of the necessity of reducing as much as possible the losses suffered by plants unfortunate enough to be flooded.

More time may be taken with the secondary job if restoring the appearance of the plant and the workman's pride in his equipment, but this task is no less essential. It will help a great deal in erasing memory of the tragedy and waste the swollen rivers have caused.

Acme photo.

Railroad round houses at West Springfield, Mass., were under 8 ft. of water; not a state in New England escaped the catastrophe

Only since the World War have machine tools been shown at the 700-year old Leipzig Fair. This spring 408 manufacturers exhibited, being housed in the Engineering Section shown at right



MACHINE TOOLS at LEIPZIG

WITH the possible exception of the Cleveland Machine Tool Show last year, the machine tool display at the Leipzig Fair, March 1-9, was the most important of its kind ever held anywhere. Even Cleveland's supremacy is questioned by some who saw both shows. The point need not be argued, because both were superlative displays of progressive management and of designing and manufacturing genius.

From reports of previous years, *American Machinist* readers are somewhat familiar with the general nature of the Leipzig Fairs as a whole. The picture, to show it again for a moment, is that of a great group of strictly commercial exhibits, shown in the spring and fall of every year.

To an American, this institution is incredibly old—700 years in fact. The Spring Fair of 1936, here reported, was number 1975.

The Fair dominates the life of this ancient, yet modern, city of three-quarter million population. Twice annually Leipzig awaits the hordes of buyers who flock here from the far corners of the earth, as well as from all Germany. In the city proper they crowd into 34 buildings devoted to every variety of consumer merchandise, from cameras and musical instruments to clothing and Dresden china.

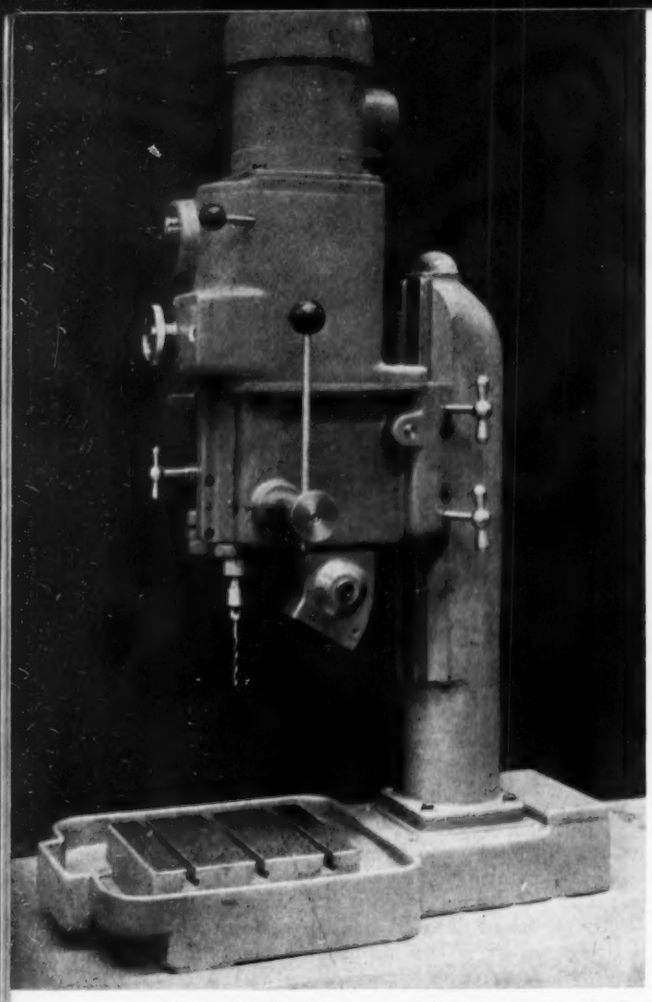
A mile or so out, is the great Engineering Fair with eighteen permanent exhibition halls, some larger than Madison Square Garden in New York.

This year the show started on Sunday, March 1. Figures available by Tuesday of the same week indicated that Fair exhibitors numbered 8,163 (7,691 German). About 220,000 potential buyers, the greatest number in Leipzig history, came to town. Hotels and outlying boarding houses were packed. Great crowds surged through the city streets on foot and in cars. Except incidentally, or at night, these were not holiday makers, but business men. The Leipzig Fair is for business exclusively—no midways or "educational features."

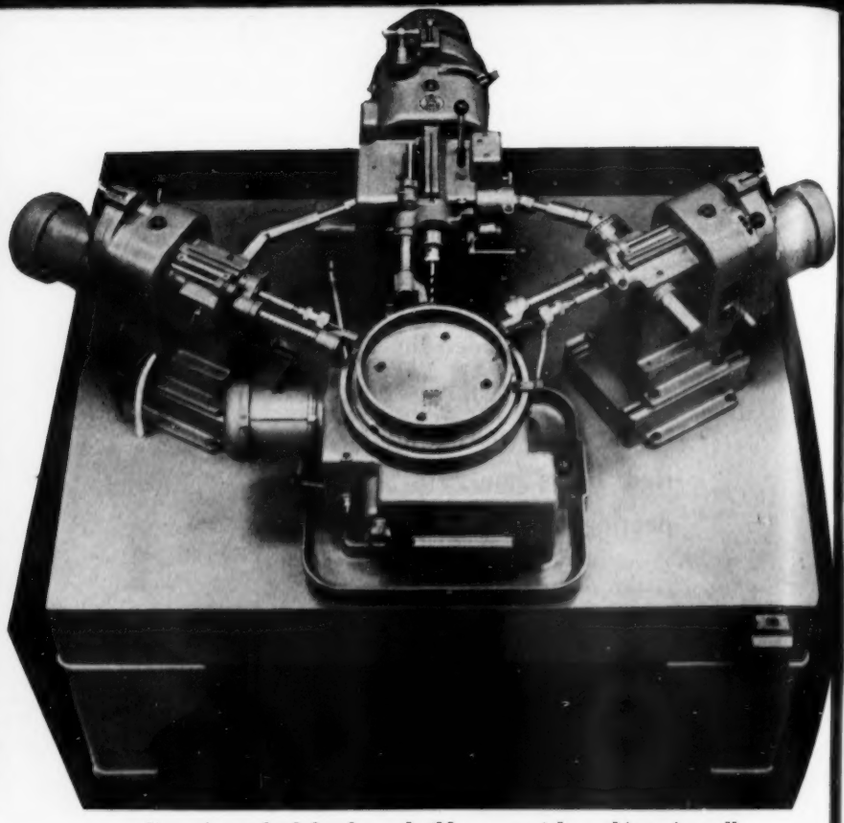
At the Engineering Fair the great Hall 9, devoted exclusively to machine tools (including machine-shop gages, instruments and accessories) opened its doors promptly at 8 a.m. Sunday. All stands of the 408 exhibitors were in order, all machines ready to operate and most of them in operation.

Within two hours the floor was packed with visitors. By 2 p.m. a total of 80,000 had passed the turnstiles of the Engineering Fair. On Sunday the congestion was so great that it was difficult to get near the more interesting machines, but on

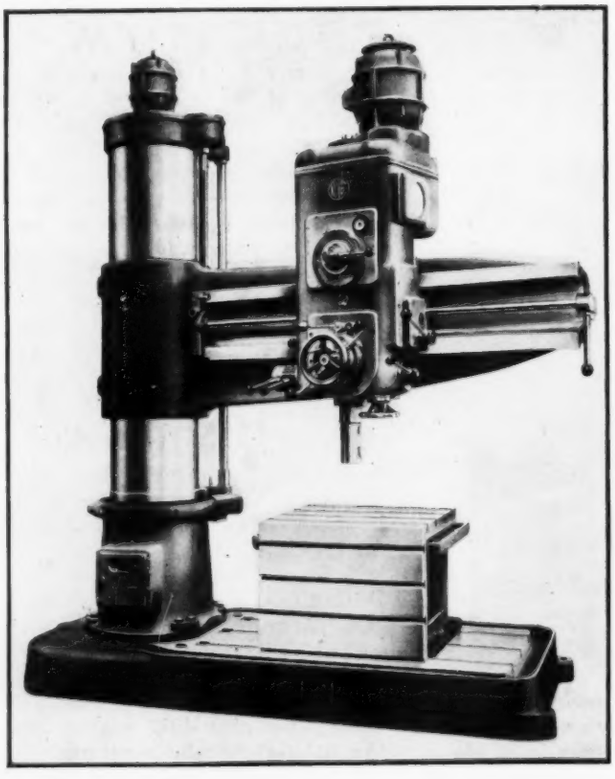
Hall 9 is a permanent exhibition building for machine tools and thus has architectural features not possible in American halls which must be devoted to many purposes. Even so, a crowd can quickly thicken the air with smoke

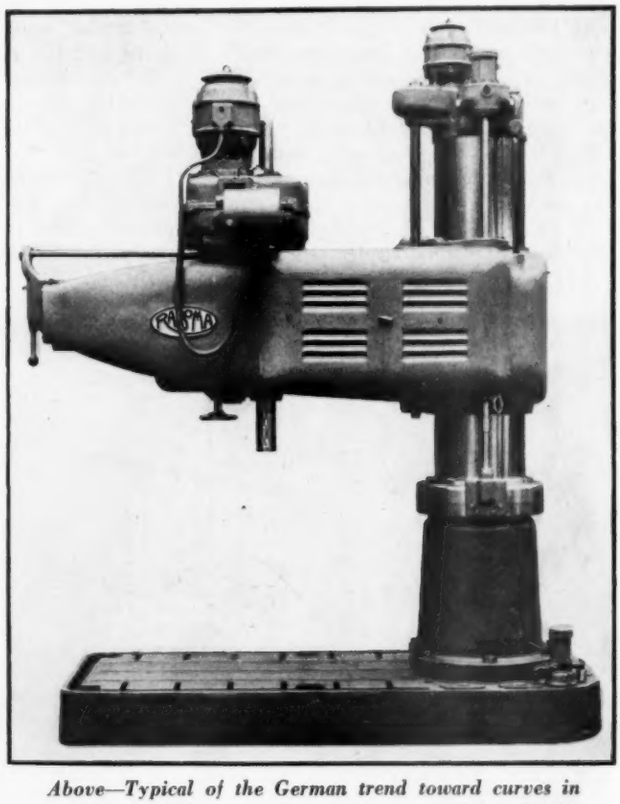


Work illumination is provided in the Auerbach & Scheibe bench drill by a built-in patented lamp



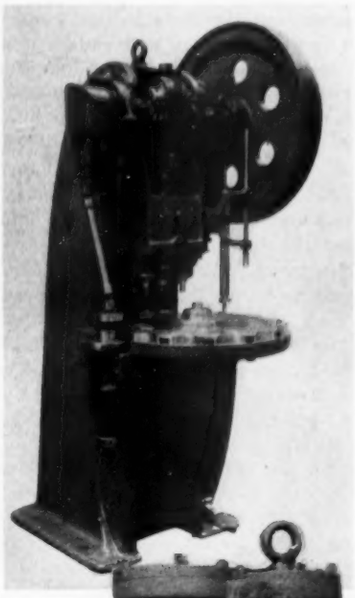
Use of standard heads to build up special machines is well understood abroad. In this Auerbach & Scheibe design the feed for the side heads is taken from the center head

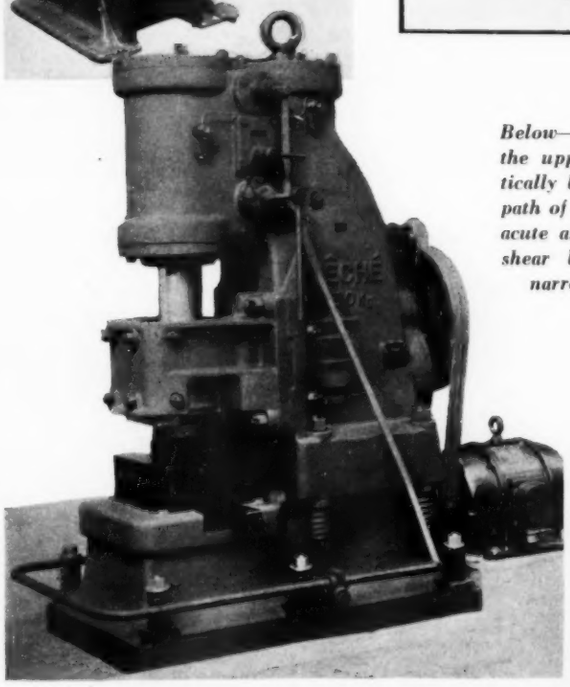




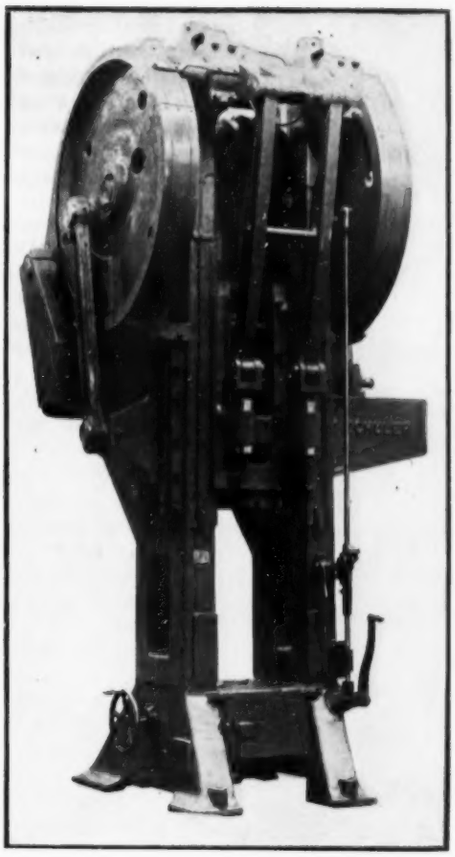
Above—Typical of the German trend toward curves in machine members is the arm construction of this Raboma radial drill. This improved model has eighteen spindle speeds secured with one lever. Left—The Kolb radial drill is built in four capacities—60, 70, 80 and 100 mm. Controls are grouped conveniently

Below—A double-sided frame in this Schuler press with turntable feed permits a wider slide with room for three tools. The first tool has an arm for the special ejector that makes superfluous the former inclined press design. Turntable drive is effected by a modified Geneva motion



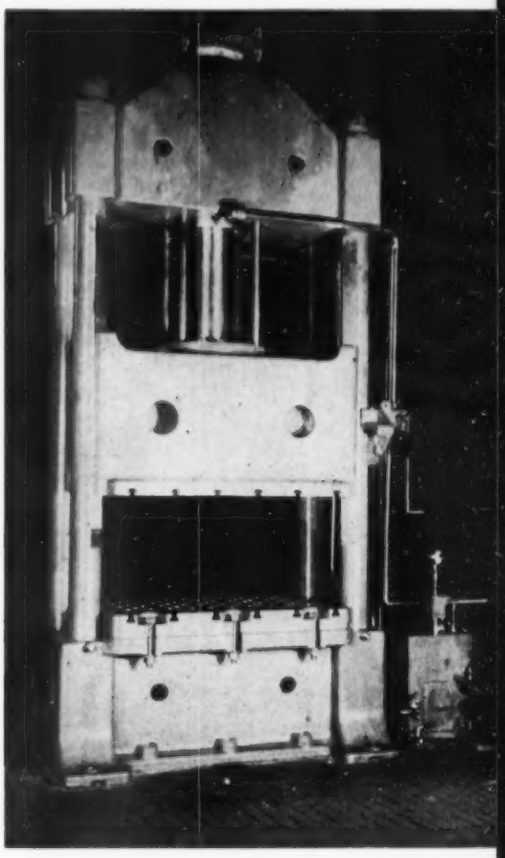


Above—Bêché & Gros Type LG 4 pneumatic forging hammer equipped with a double guide for the tup to allow mass production of small forgings in multiple dies. The tup weighs 150 kilos. Drive is transmitted to the crankshaft by means of V-belts and an intermediate gear

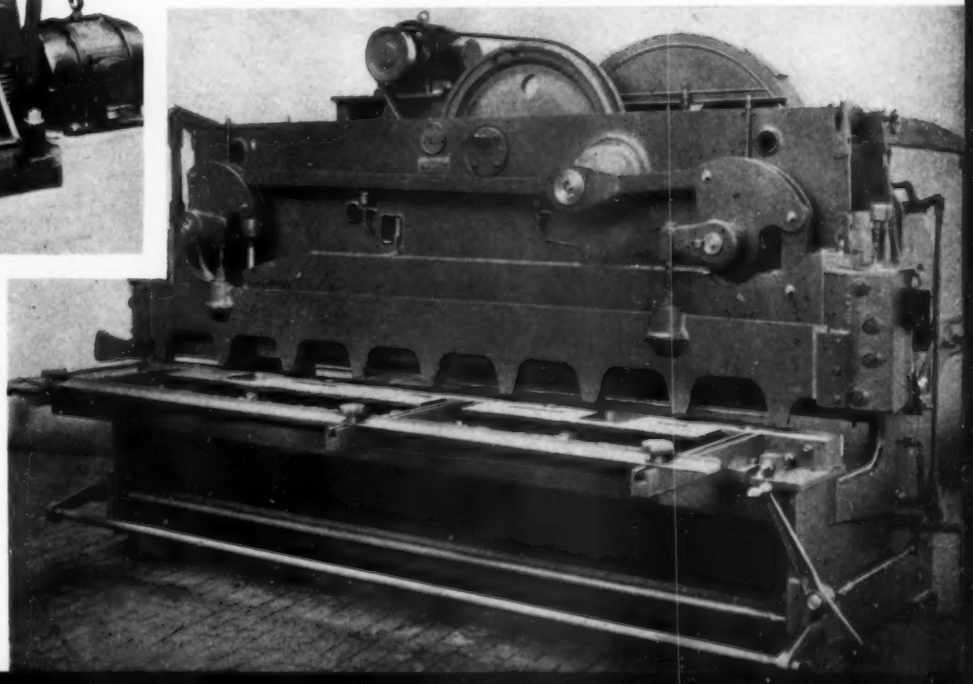


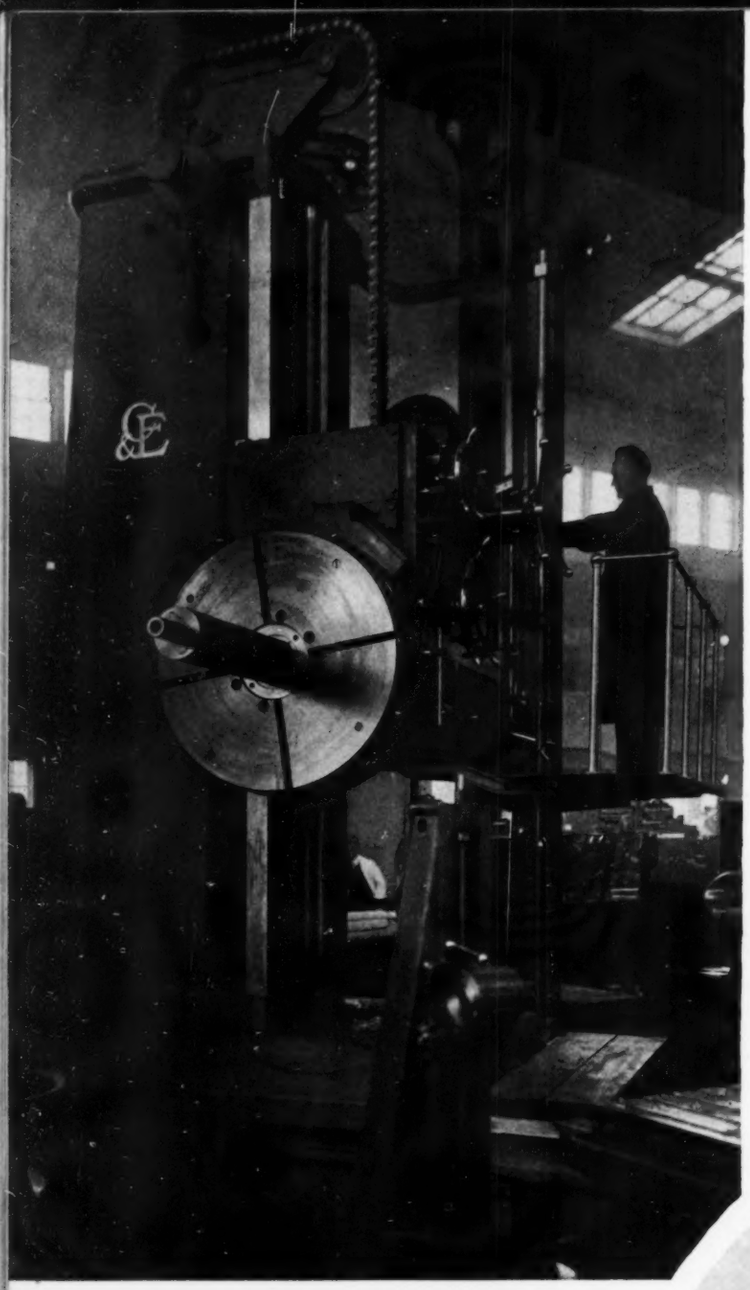
Left—Width between uprights of this Schuler heavy drawing press is suitable for small work, but the members are proportioned for comparatively thick shells. The blank holder is toggle operated

Below—In the Götz plastic molding press four vertical guides for the ram prevent mis-matching of the mold halves. A pump can be used or accumulator service provided



Below—On the Pels guillotine shear the upper slide does not move vertically but at a slant. The downward path of the upper shear blade is at an acute angle to the face of the upper shear blade which aids in cutting narrow and wide strips parallel





Erection of large machines on the Fair Grounds, of which this Collet & Engelhard boring machine is an example, was undertaken by several German firms

Monday the crowds thinned to about the right density for maximum sales efficiency.

In number of machine tool exhibits this year's Fair was 30 per cent ahead of 1935, completely filling the galleries as well as the main floor. Even some of the smaller machine tools were forced into the galleries, along with gages, instruments and accessories. Two moving staircases carried a steady flood of visitors to this upper level.

The exhibits were predominantly German. No American or British firms were represented. Foreign visitors, however, showed a big increase over last year. No statistics on this point were available at this writing, but the Fair management estimated that more than 25,000 non-Germans would visit the Fair. This figure, of course, is for the entire Leipzig Fair, not merely for the machine-tool exhibition.

From the impression the *American Machinist* representative received, the German machine-tool front is moving forward rapidly and in an unbroken line. This steady progress seems to be based on solid improvements rather than on eye-catching gadgets. Few advances from last year can be described as revolutionary, but many builders are perfecting the details of their machines for simpler and more rapid control, greater precision, greater strength, better appearance.

One representative explained that the German tool builders are too busy with orders to find time to play with radical innovations. Firms in general seem to be behind in their orders from 6 to 12 months. Some report as high as 18 months.

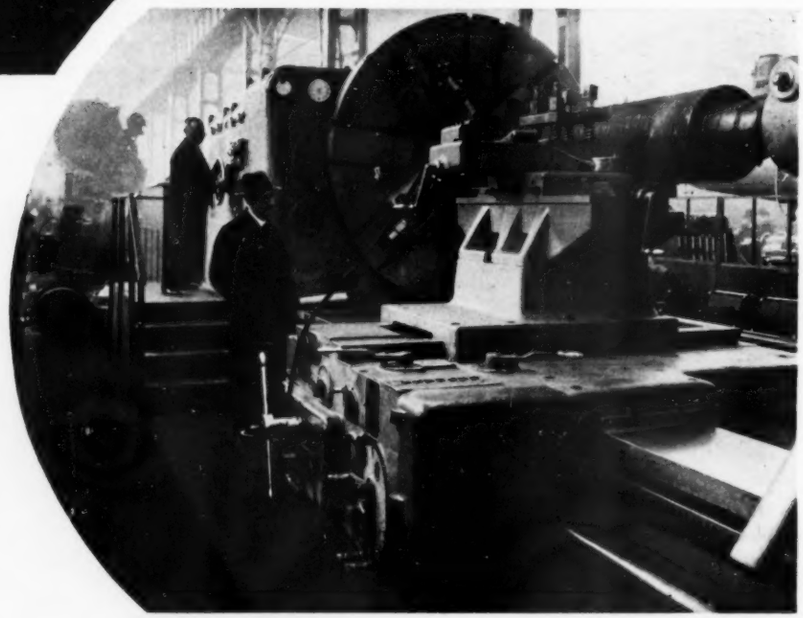
The trend toward the further perfection of machine forms was very evident. For some years German designers have favored flowing, tapered and elliptical lines, what might loosely be termed "streamlining." This year it went further. One saw everywhere raindrop-shaped lathe headstocks, "half-oval" radial drill arms, the almost universal substitution of curves for corners. To an American eye, the general effect is extremely pleasing, since the forms used seem to be justified on mechanical as well as artistic grounds.

Another very evident trend was toward the further simplification of machine control. Levers follow the natural or "instinctive" movement of the operator as does the "joystick" of an airplane. Often a single lever moved in these natural ways will control four or five different movements of the machine.

On the other hand, one did not see, as at Cleveland, large banks of push buttons. At Leipzig there were rarely more than four in one group.

Many controls were arranged to permit operation with the workman seated. Hundreds of machine tools on display used from one to five flange motors, one motor for each feed or drive, but these appeared to be no more common than last year.

On the contrary there was evident a distinct trend, on the



Henry Simon, contributor to American Machinist and collaborator on this report, stands beside the largest lathe exhibited—a Schiess-Defries. The spindle runs at speeds up to 850 r.p.m.

part of some firms, to go back to earlier practices. Several firms are now emulating one builder of fine lathes who steadfastly refused to mount either motor or reduction gearing in his headstocks. Motor and gearing are in the pedestal base, and spindle drive is by a broad flat leather belt. The spindle belt pulley runs on independent roller bearings to relieve the spindle itself of belt pull. For the spindle bearing proper this maker prefers a bronze sleeve bearing to ball or roller bearings. He stressed the need (in lathes guaranteed to turn round within 1/1000 mm.) of avoiding all direct transfer of motor or gear vibration to spindle or work.

Another reversal of former trends appeared in certain grinders and large high-speed lathes where ball bearings have been replaced by sleeve-bearings. The smaller grinders continue to use ball bearings.

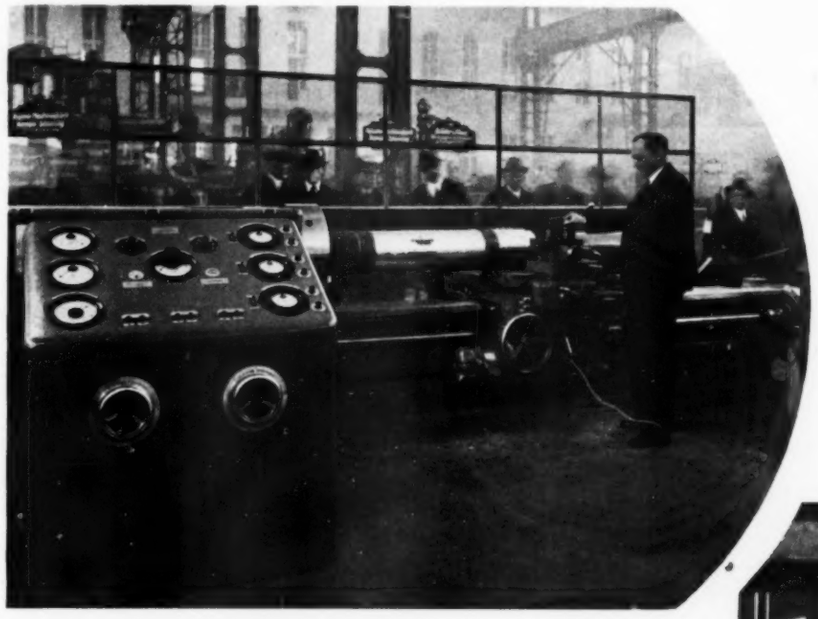
In some millers the hand feed had been reintroduced. Cemented carbide tools were, of course, widely used on lathes, planers and shapers. However, these tools, as well as very high rates of metal removal (i.e. many pounds per minute) were less stressed than at Cleveland.

The majority of the exhibits were of general-purpose machines, such as engine lathes, planers, shapers, millers. Even such more specialized machines as spiral gear grinders were designed to accommodate a variety of work with a minimum of single-job parts. In the matter of precision it is the general opinion of German builders that the best German and the best American machines are about equal. They acknowledge, however, that America excells in the mass-production tools.

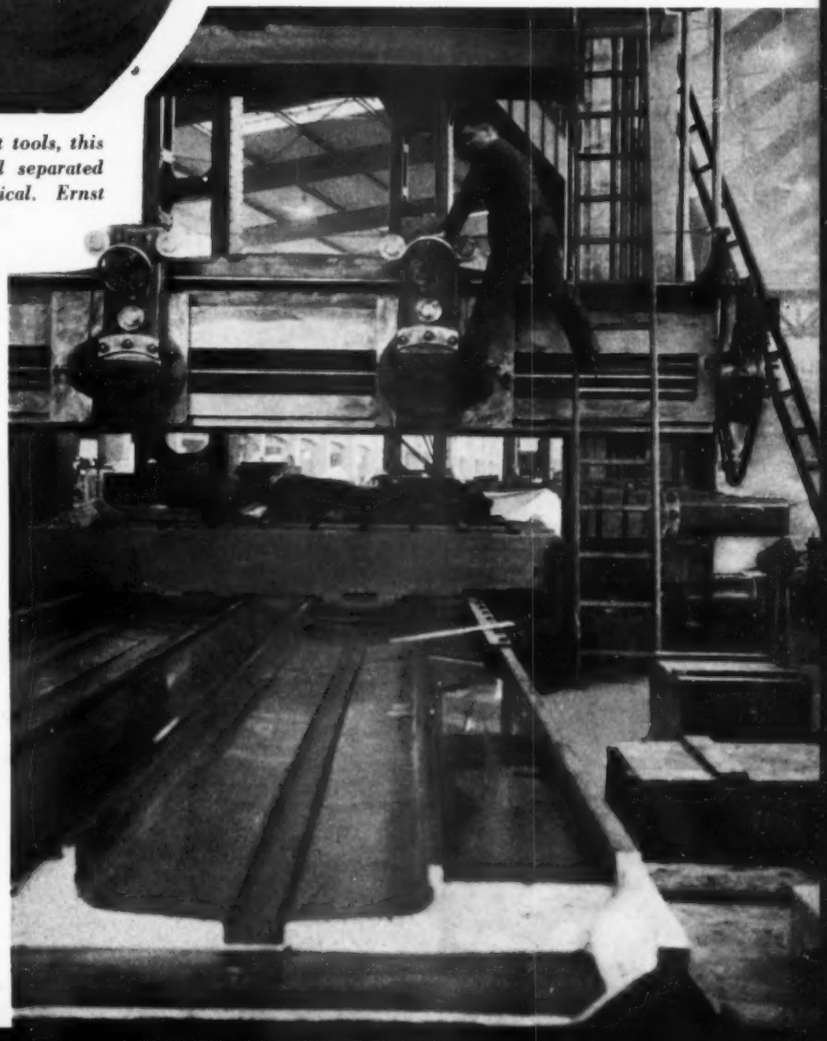
Germany has long been a country of bold engineering enterprises. At the Leipzig Fair, particularly, machine tools of gigantic proportions have annually attracted attention. Several such tools were on exhibit again this year and, as usual, attracted general interest. One of these was a large lathe of the latest design by Schiess-Defries A.-G. (Düsseldorf). This lathe, which has a swing of 2.4 meters over bed and 1.9 meters over carriage, weighs 180 metric tons and takes 25 meters between centers. It was impossible to set up the entire bed, but a 15-meter section was in place. Even this huge machine is merely one of the smaller sizes made by Schiess-Defries. One of their lathes will swing 6 meters, will take work to 100 tons and has three carriages that can work independently. The lathe exhibited at the Fair is equipped with a special taper-turning arrangement and has a single push-button control for changing from feed to quick travel and vice versa.

Another giant machine was a horizontal boring and turning mill by Collet & Engelhardt.

A machine somewhat out of the ordinary was an experimental lathe developed by the Schiess-Defries A.-G. for the use of steel mill and large manufacturing concerns in testing the working properties of new alloy. This lathe has a large range of speeds, which can be varied (without steps) from the control panel shown at the left in the photograph. Handwheels give both coarse and fine regulation of



Used to determine the machinability of metals and to test tools, this Schiess-Defries experimental lathe has the control panel separated from the headstock by a gangway. The headstock is cubical. Ernst Grund, advertising manager, looks over his firm's product



Setting up the Waldrich planer was a good-sized job. The weight is approximately 125,000 kg. Table speeds are 4.5-25.5 m. per min. and the return speeds 11.3-27 m. per min.

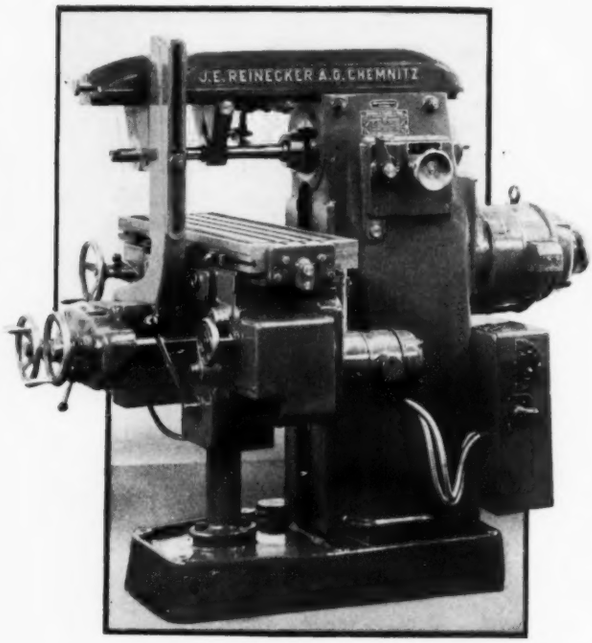
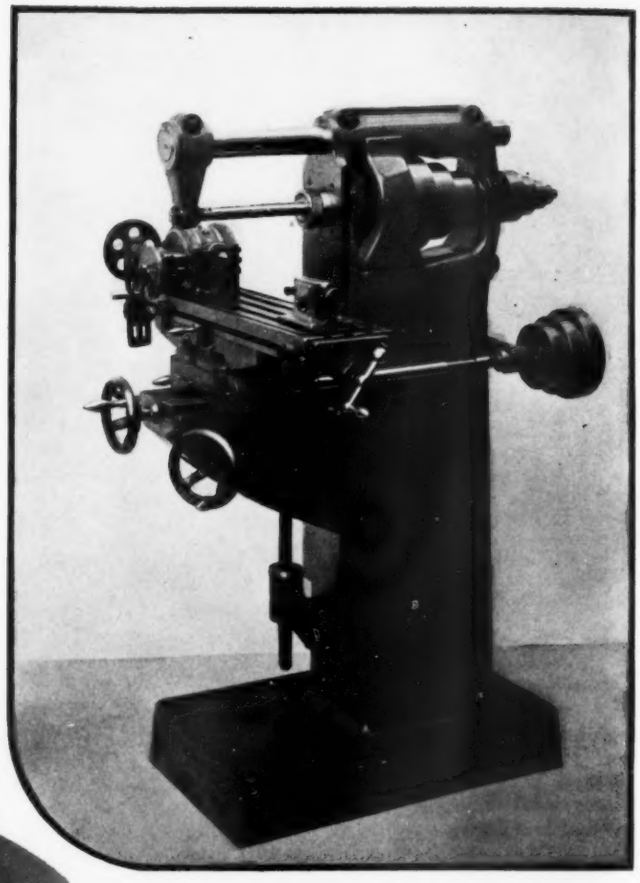
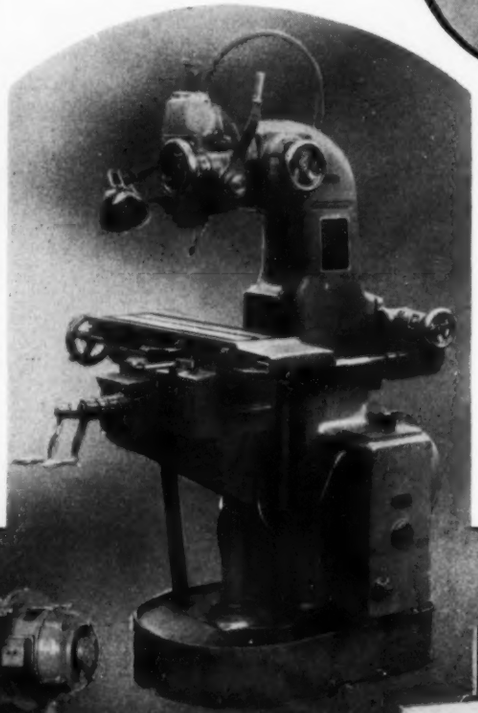


Table surface of this Reinecker special miller is 1,100x 315 mm. Single lever operation is provided for length, cross and vertical movements as well as for feed and rapid traverse. The machine does climb milling



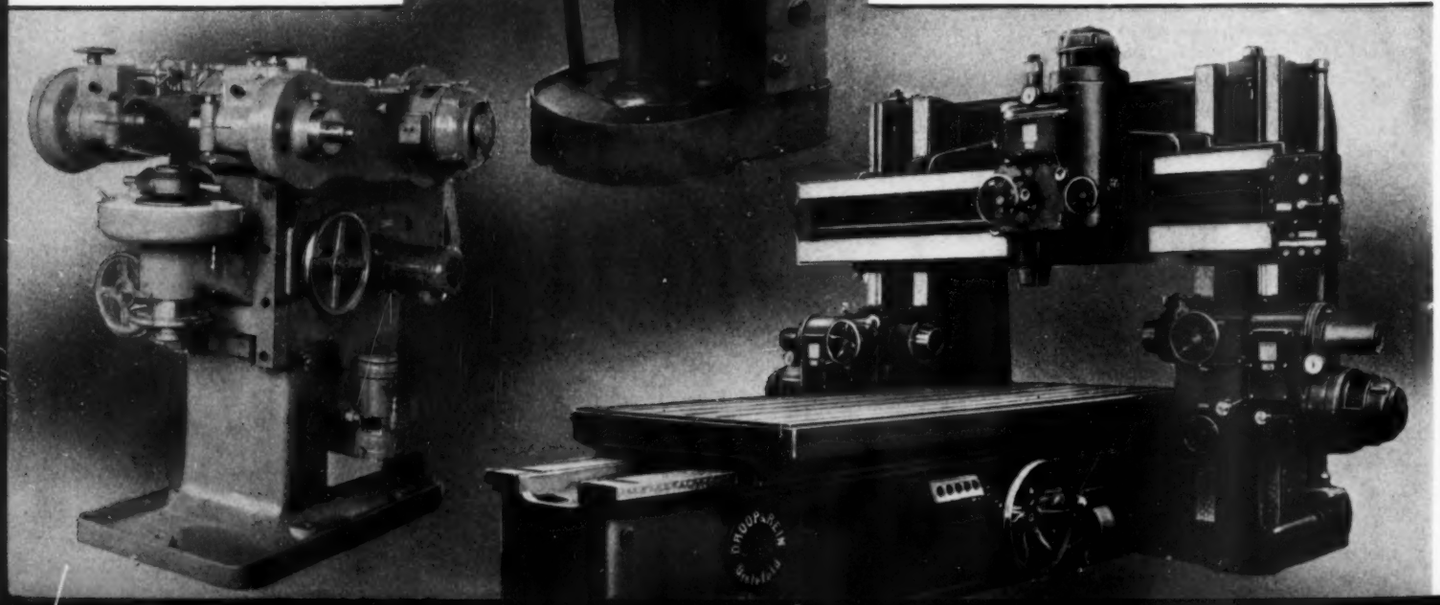
Cone-pulley machines remain popular abroad. This Krebs universal miller is typical, but the company also makes motor-driven types. This machine is fitted with a mechanical reverse

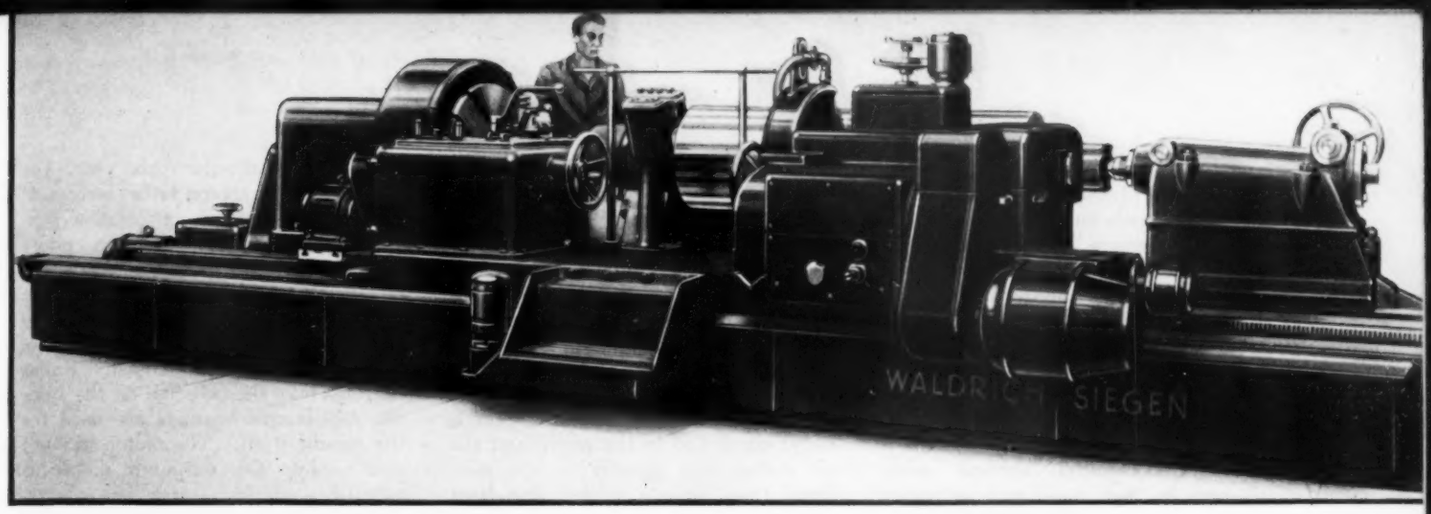
Below—Droop & Rein offers a two-spindle opposed milling machine for flats on spindles, valve bodies and nuts. The chuck on the vertical spindle is adjustable for height and has dividing means. Feed and rapid reverse of the two horizontal spindles are automatic. The spindles are mounted in a saddle



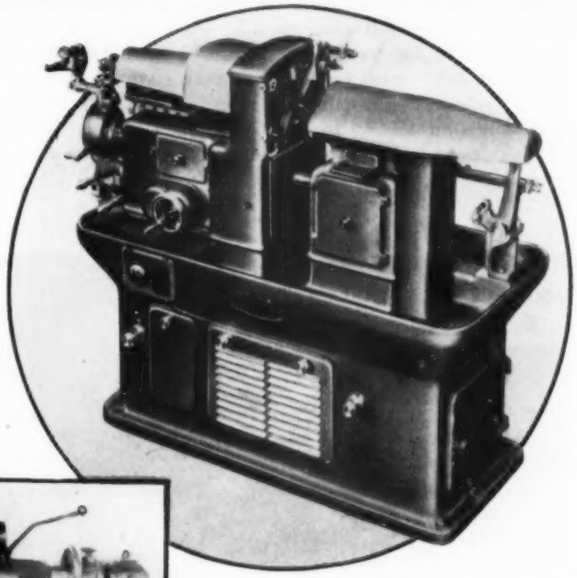
Left—Single-lever control is provided in the Fritz Werner small miller: first step to the right, spindle starts; second step, table feeds from left to right; lever returned to neutral, spindle is braked

Below—Droop & Rein planer-type miller with three heads driven by flange motors. An identical lever on each side of the planer controls head motors, feed motor and power traverse

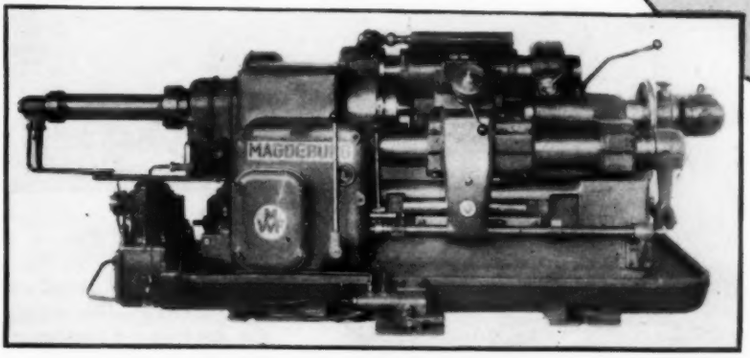




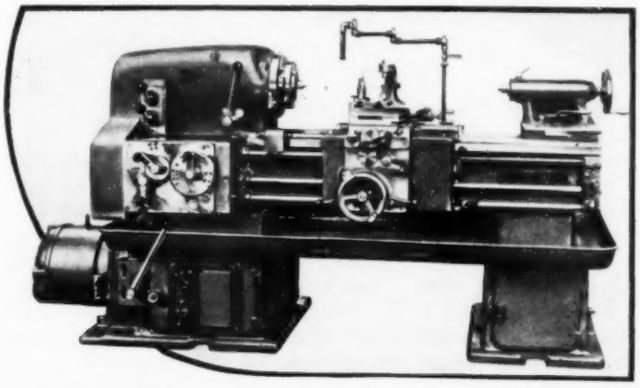
Mirror-finish grinding of rolls is the function of this Waldrich machine. It will grind rolls 650 mm. in diameter with a 600 mm. wheel. Work-spindle drive is by a combination of belt and chain to give chatter-free grinding. A simple camber adjustment is provided. Controls are grouped in a cabinet. The grinder operates on direct current



Below—Magdeburg semi-automatic lathe which uses the "Chip Flow" principle (tools cutting downward). Three guide bars carry toolslides and they support the hydraulic tailstock. Tools are changed in 20 sec.

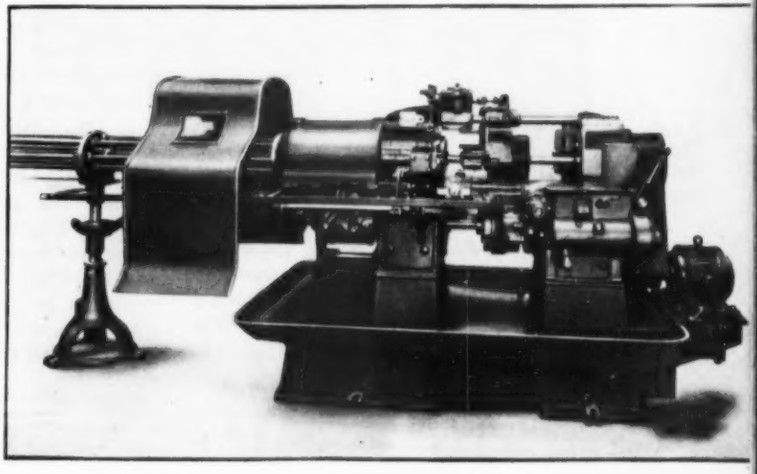


Above—Pittler Model LA 16/130 automatic screw machine is suitable for machining brass and steel. Production time ranges from 1-200 sec. Working precision, 0.01 mm. for diameter and length



Above—Typical of present trends in German lathe design in this Loewe machine with bullet-shaped headstock. The vogue for streamlining and curves is becoming general in German machines. Another trend is the use of a flange motor in the cabinet leg as shown

*Below—*The *Schütte SB 16 six-spindle rod automatic for 16-mm. stock has noiseless guide tubes and the rod holder positively feeds the bars. Work spindles run in roller bearings. The machine has a built-in drilling attachment*



spindle speeds. In addition, a motor at the end of the bed will vary the feed. The dials on the panel show the different pressure components on the tool as well as the electrical data.

Passing on to the regular factory tools, some interesting developments were noticeable.

The planers by Billeter & Klunz have four forward and two return speeds, all of which are engaged by two levers.

Loewe - Gesfürel showed many changes in their hand and automatic millers. Most notable was the single-lever control for all motions. In the hand miller, for example, the lever must be *held* open for quick travel. When released it snaps back automatically and throws in the feed. A similar lever in the automatic miller throws out the feed (and backs up the table) at the end of the working travel.

Other Loewe-Gesfürel novelties included hinged moving chip and oil guards, feed box mounted on cross-slide instead of on column, very rapid and convenient change of gears. All of these millers have roller bearings.

Lange & Geilen displayed a big bench of hydraulic shapers, all in operation. In these machines the motor is direct connected to the pump and the oil stream acts directly on the ram. Dead time (return stroke) has been greatly reduced—for example, to 23 per cent in roughing at a speed of 15 meters per minute. In general, this firm claimed short working time.

One of the most interesting machines shown was the Fritz Werner splineshaft grinder illustrated. The wheel profile is given the form of the complete groove to be cut, consisting of a cylindrical bottom (refers to the groove in the splineshaft) and straight sides. To dress the wheel (in position) to this exact profile, two diamonds are mounted on hand levers in the machine. One pivots for the circular profile, while the other moves straight to dress the sides. It takes only a moment to true the wheel and lower it into working position.

Werner is one of the firms that has gone from ball bearings to sleeve bearings to avoid chatter.

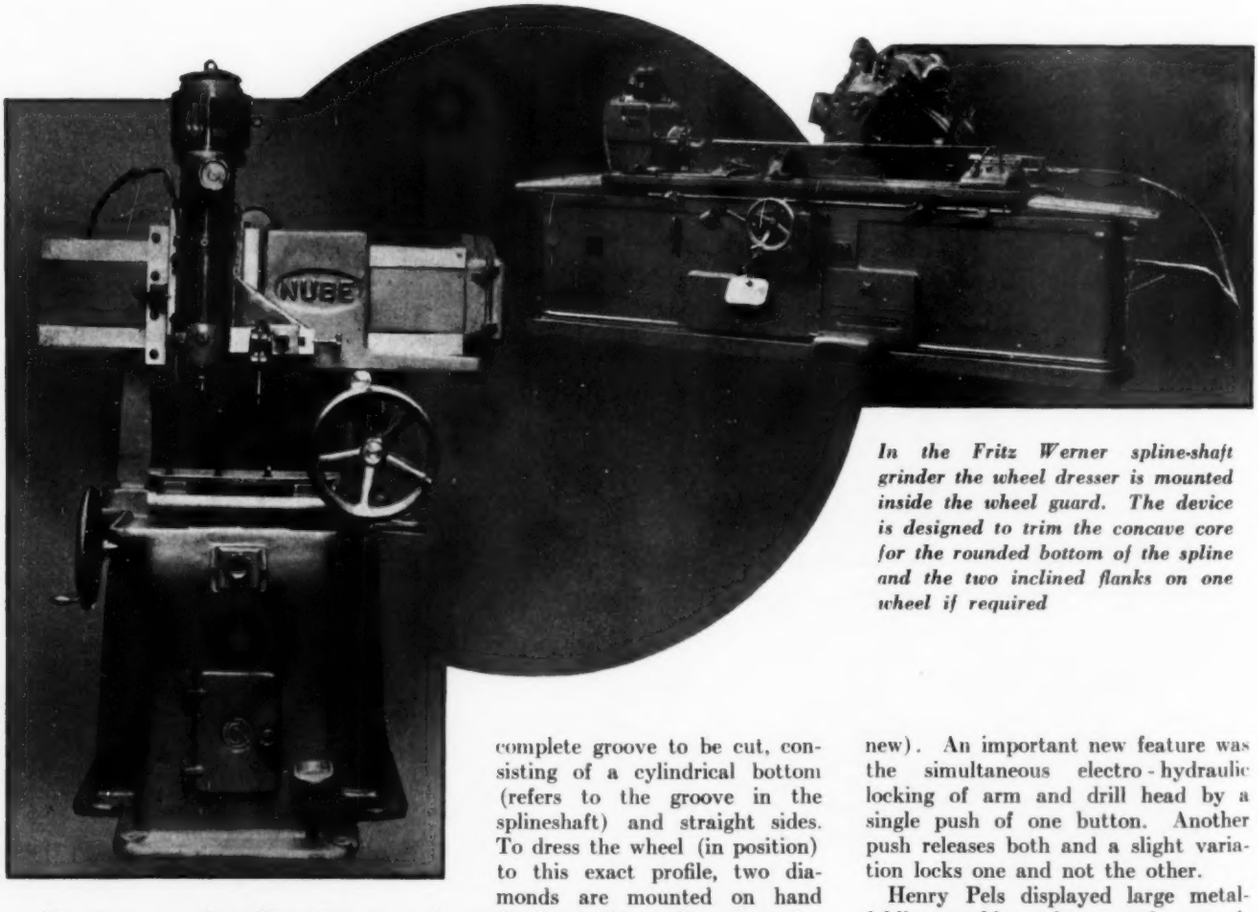
Although not new this year, the Kaerger high-precision lathes were notable because of their conservative progressiveness. Every gear in every lathe is hardened and ground. Kaerger claims that no other lathe can cut as many different screw threads. They make three basic sizes, from which special machines are developed. Roller bearings take the belt pull on the spindle, but bronze bearings are used for the spindle itself. The motor will not start unless the oil-pump motor is running.

Many other interesting lathes were shown. Loewe-Gesfürel, for example, demonstrated the turning of light metal alloy at the rate of 1,800 r.p.m. on 40-cm. diameter work.

Raboma displayed their line of radial drills, notable for beauty of line, particularly the oval form of the arm (not new). An important new feature was the simultaneous electro - hydraulic locking of arm and drill head by a single push of one button. Another push releases both and a slight variation locks one and not the other.

Henry Pels displayed large metal-folding machines of neat and economical design, but without notable changes from last year. The Pels frames (on folding machines and presses) are welded from heavy plate.

Pitler showed a good-looking line of automatic screw machines, but no radical improvements were noted.



In the Fritz Werner spline-shaft grinder the wheel dresser is mounted inside the wheel guard. The device is designed to trim the concave core for the rounded bottom of the spline and the two inclined flanks on one wheel if required

Dies in two or three dimensions are copied in 1:1 ratio on the Curd Nube Model KIIIK profiling machine. In this model the tracer and cutter are controlled vertically by a micrometer screw. Table surface, 450x380 mm.; table movement, 475 mm.; spindle movement, 75 mm.

Editorials

AMERICAN MACHINIST ESTABLISHED 1877
VOLUME 80 NUMBER 7
K. H. CONDIT • F. H. COLVIN
EDITORS

AGAIN ON THE AGGRESSIVE

EDITORIALS in two of New York's leading morning dailies a few days ago dealt with a change in mental attitude that is taking place—from the defeatism of despair to the courage of confidence.

Abroad vigorous steps are being taken to prevent the outbreak of another world war which many have held to be unavoidable. Dictatorships have not been able to solve the problems that bogged down the democracies. They are not so popular, and those who believe in democratic principles are daring to hope once more.

Our own experiments in managed economy have not been as successful as their originators had expected. As a result there are rumblings from the farms as well as from business and industry that have sobered the joy-riding administration theorists, and have revived the moribund opposition party.

Imminent calls for more taxes, direct as well as indirect, have stimulated demands for a more realistic approach to the relief problem and for immediate retrenchment in federal spending.

Producers of machines have turned at last on the pseudo-economists who have been baiting them for so long, and have collected and printed the facts of machinery's contribution to advancing civilization.

It has finally dawned on employers that properly trained workers are scarce. Most of the qualified ones have jobs, the others have either lost their skill through long lay-offs or else never had any. It is a sign of the new mental attitude that employers no longer content themselves with bemoaning the situation, but instead tackle the job of reviving old training plans or inaugurating new ones.

IT IS high time for business and industry to take the aggressive and maintain it. Mr. Roosevelt and his friends have taken three years to prove that they do not know the answer to the unemployment problem. PWA and WPA, Ickes' ideas and Hopkins' hopes, are not an answer. Private employment is the only final solution, and only private industry can supply that.

Private industry has already taken back an appreciable proportion of those who ordinarily work in its plants. To increase its sales and activity so that it can take back the rest, and thereby raise the demands on the service industries so that they can return to normal, will require more management skill and aggressive enterprise than we have shown since the war. But it is the only way out and it must be taken regardless of Washington.

Depreciation

IF the Roosevelt proposal to tax corporation surpluses becomes law, as seems more than likely, deductions for such items as depreciation reserves will be of major importance. For this reason Professor Norton's thoughtful and practical discussion of depreciation on page 269 will stand careful study. In it he explains in some detail the change in attitude at the Bureau of Internal Revenue since Decision 4422 was issued. The Bureau is much more realistic than it used to be, and its new attitude will force manufacturers to be more realistic too. Under the threatened tax provisions realism on the part of everyone will be our only salvation.

Better Managers

MANAGEMENT is becoming an increasingly difficult problem and one that requires greater capacity than ever before. It can no longer consider only the activities in the plants themselves but must take into account the communities in which they are located. Training must be so planned as to utilize the class of labor available in the community as unemployment adds to the cost of government, and to the taxes which must be assessed. These in turn add to the cost of manufacture.

Changes of methods and the introduction of new machines must be planned so as to disturb employment as little as possible. For even if management fails to consider this as a social responsibility, its cost is an item to be reckoned with in competition with similar products.

All these increasing responsibilities demand men of higher capabilities, men who have a broader vision than has ever before been necessary. Concerns in which executive positions are looked upon as easy berths for unqualified relatives are doomed to trial and tribulation.

Chips

WASHINGTON—D. C. federal court enjoins Black Committee from seizing telegrams on blanket subpoena . . . Senate drops ship subsidy fund from P. O. bill . . . McCarl and Douglas under consideration as experts for Senate coordinating committee . . . Florida canal funds out of Army bill as it reaches Senate, and stay out . . . Senator Holt protests Hopkins whitewash for West Virginia relief scandal . . . Budget Director Bell clamps down on new WPA projects . . . Berry's council recommends permanent advisory body, questions effectiveness of Federal Trade Commission and anti-trust laws . . . NRA report, long delayed, shows industry adhering to code regulations rather generally . . . Roosevelt asks for $1,500,000,000 for relief, Senators grumble about signing more blank checks.

FOREIGN—Locarno diplomatists move to London to obtain quieter atmosphere . . . France and Belgium would drive Hitler's troops from Rhineland treaty zone, finally agree to receive his envoy on equal terms at London . . . French senate ratifies Russian defense treaty as opposition is silenced by German moves . . . Leipzig Spring Fair larger than ever, attracts more buyers (see pages 272 a-h) . . . New Japanese cabinet pledges peace efforts . . . Russia offers settlement of border dispute.

FINANCE—National debt rises to $31,400,000,000 . . . U. S. Steel writes down earned surplus by 50 per cent to cover equipment depreciation . . . FDIC moves to wipe out 100 weak banks by combining them with strong ones . . . Foreign exchanges hold up remarkably well in face of war scare . . . Income tax receipts for first quarter up nearly 50 per cent.

INDUSTRY—New York Central introduces store door delivery and pickup system allowing a deduction of five cents a hundred pounds for shippers who use their own trucks, truck drivers threaten strike . . . Automobile companies go back to capacity operation as warm weather brings in flood of orders . . . Akron citizens to organize to help break rubber strike as Father Coughlin urges workers to organize and strike if necessary to get more money . . . New York State unemployment insurance law ruled unconstitutional . . . Niles-Bement-Pond and General Machinery to merge . . . Floods in Pennsylvania and New England do large damage to industrial plants . . . Bethlehem Steel runs billet-laden cars on Johnstown bridge to save it . . . Pittsburgh plants closed down as water submerges them, repairs expected to take from a few days to a month . . . Only transportation is by air as railroads and highways are washed out . . . Endicott plants of I.B.M. and Endicott-Johnson flooded, boats used to survey damage to equipment . . . G.E. pensioners received $2,500,000 in 1935.

INDICATORS—Steel production rises strongly, passes 60 per cent . . . Electric power output up in reversal of recent trend . . . *Business Week's* index slips off to 67.9.

Watching Washington

President delays fishing but not Congressional committees . . . Relief figure contributes to record budget . . . Congress still studies taxes to foot the bill . . . Restrictive bills abound at Capitol

WASHINGTON—Although the Chief Executive has gone to the South Atlantic for his fishing, those at home also enjoy the sport. Congressional committees, undisturbed by the swollen Potomac, continue to fish for information on corporate activities; for ways to raise money without paining their constituents; and for formulas that will enable New Deal bills to avoid Constitutional objections.

The belated budget was completed by the President's recommendation that $1,500,000,000 be added for relief during the coming fiscal year. This sum is tacked on to the $2,000,000,000 already allotted for recovery, pump priming and relief, either as unexpended remnants of 1936 appropriations or sprinkled throughout the regular budget. The result is a record budget of well over $8,000,000,000. Counting only bonus amortization rather than the full cost, a deficit of close to $2,500,000,000 is foreshadowed.

In asking for the addition WPA fund, the President took opportunity to warn industry that even this figure was dependent on reabsorption of the unemployed by private enterprise. He even hinted that progress in this direction might determine whether governmental control of industry would be restored. This attitude ignores the fact that industry is only too glad to provide jobs when orders justify it and that orders flow more freely without threats on the part of the Administration.

All budget estimates presuppose that additional taxes will be levied to produce revenue equal to that outlined in the President's proposal. Some tax experts and law makers feel, however, that a great risk would be incurred by discarding such proved sources of revenue as the corporate income tax ($1,000,000,000 yield), the capital stock tax ($150,000,000 yield), and the excess profits tax. At the present rate, this last tax produces only $6,000,000 but could be made to yield more. It is claimed that estimates of the yield of the surplus tax are merely guesses.

With all the talk in the past three years about stabilizing our economic structure by dampening violent swings in the business cycle, Congress hesitates to destroy the balance wheel of corporate surpluses by taxing them in their entirety. Rather than adopt the President's radical plan, some would exempt the first five or ten per cent on a fixed amount. The demand for a cushion against a depression on temporary adversity will not down. The present slant in the House Ways and Means Committee is to retain present corporate taxes and add a tax on undistributed earnings but at a lower rate than the President advocated.

No Dearth in Bills

Whether it is because business is considered to have had a sufficiently long "breathing spell" or whether the habit for "reform" once started is difficult to break, there are a number of bills now under consideration that would extend the provisions of the anti-trust laws and the Federal Trade Commission act to thousands of transactions which occur daily and which heretofore have been beyond the scope of these statutes. There are for instance the "price discrimination" bills, proposed by Senators Robinson, Patman and Copeland and by Representative Utterback. Ostensibly to protect the "little man," the proposed legislation would neutralize the efficient merchandising inaugurated by chains and cooperatives and directly hit the consumer pocketbook.

Then, there are the so-called "basing point" bills introduced by Senator Wheeler and Representative Utterback which would prohibit basing point and delivered price systems now used by the steel, rubber, cement, sugar milling and grocery industries. Another Wheeler bill and also the Rayburn bill would extend jurisdiction of the Federal Trade Commission far beyond unfair methods of competition in interstate commerce and remove many of the limitations the present act imposes upon the Commission's powers.

Senators Borah and O'Mahoney have introduced bills that would require all corporations engaged in interstate commerce to procure licenses from the F.T.C. Passage of these measures would open the door to almost any kind of drastic federal regulation of companies doing business across state lines.

These proposals are for the most part based on isolated abuses in a few industries. Some of them may contain a degree of merit, but it may be readily seen that together with the Healey bill, restoring NRA provisions to government contractors and their subcontractors, they form a noose about the neck of independent management. As witnessed by the railroads, once government closes in with restrictive legislation it is only a question of time before the noose tightens leaving further industrial existence entirely in the grip of government bureaucracy. The struggle against passage of such measures is vital to the continuance of the entire concept of free enterprise and opportunity traditional in this nation.

Machines for Navy Program

Confronted with the virtual collapse of the well intentioned London naval conference and the announcement of a tremendous increase in British naval construction, Uncle Sam is going to call for more money for his own fighting fleets. Already tentative sums ranging as high as $550,000,000,000 are being mentioned for the coming fiscal year—a staggering bill even in these multi-billion days.

American business and industry is legitimately curious. Is the money going to be tossed overboard, as some insist, or is it going to be good American cash eager to help lubricate the wheels of the nation's industry? In short will the Navy dollar aid business?

Machinery is the soul of the modern fighting ship. It is hard to set any figure for the total spent by the service for machinery as the list is long and varied, and a number of bureaus are concerned with it. But figure experts at Washington agree that four to five millions for machines is a fair estimate of the conditions existing in late years. If the new program carries through that figure will be increased proportionately.

Western Machine Tool Show Was Big Success

The Pacific Coast's largest and most complete machine tool show closed March 14 in San Francisco, Calif., where more than 60 national manufacturers displayed their products for five days. A large attendance was drawn from all parts of the west, and many manufacturing executives from Middle Western and Eastern plants attended.

The show was planned and sponsored by the Moore Machinery Co. of San Francisco.

Modernization of manufacturing equipment was the keynote of the dinner which opened the show on March 10. More than 50,000 ft. of floor space was devoted to the machine tools, powered for actual demonstrations.

The *American Machinist's* 1935 survey of machine tool obsolescence was made available to all visitors at the McGraw-Hill booth.

Where 60 Manufacturers Demonstrated Modernization—**A glimpse of the crowds who attended the San Francisco Machine Tool Show, March 10 to 14, to see the latest developments in manufacturing methods**

400 Units Mold Ford Soya Plastic Frames

The Ford Motor Co. has installed 400 hydraulic presses in a new department to make garnish frames for all closed car windows from soya bean plastics. Single-cavity molds are used, taking preforms of the plastic for charging. The presses have solid steel ways for the platens, instead of cylindrical pillars, and are arranged for steam heating.

Molding and cooling presses are set in alternate rows, the moldings being moved from the one to the latter, staying there until the next molding is ready, to prevent the hot pieces from warping. Drilling holes for attaching to frames is done with a special machine and fixture.

This is the largest installation for plastic molding in the industry, and occupies a 400-ft. bay in the new Rouge glass plant. Each Tudor sedan requires five frames. Although the soya plastic costs more than steel, the saving in weight and simplicity in fabrication more than offset the difference in raw material prices. Color can be made to harmonize with the trim of the car.

PATENTS

Metal-Working Machinery

Protective Means for Guideways. Hans B. Kraut and Keith F. Gallimore, Fond du Lac, Wis., assigned to Giddings & Lewis Machine Tool Co. Patent 2,033,141.

Rotary Shear. G. Harry Case, Moline, Ill. Patent 2,033,181.

Grinding Machine. Frederick S. Haas and Bernard A. Kearns, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 2,033,335.

Machine Tool. Willetts Peaslee, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 2,033,395.

Machine Tool Organization. Edgar D. Vancil and Frederick S. Haas, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 2,033,406.

Machine Tool Mechanism. Millard Romaine, Cincinnati, and Erwin G. Roehm, Norwood, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 2,033,449.

Planetary Milling Machine. Millard Romaine, Cincinnati, and Erwin G. Roehm, Norwood, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 2,033,450.

Multiple Spindle Automatic Screw Machine. Charlie W. Simpson, Windsor, Vt., assigned to National Acme Co. Patent 2,033,490.

Adjusting Device in Machine Tools for Adjustment of a Tool Rest. John Bergstrom, Vaster, Halmstad, Sweden, assigned to Aktiebolaget Malcus Holmquist. Patent 2,033,677.

Device for Making Flexible Tubing from Strip Material. Josef Kopetz, Vienna, Austria. Patent 2,033,717.

Milling Machine Head. John M. Walter, Cincinnati, Ohio, assigned to the G. A. Gray Co. Patent 2,033,749.

Multiple Automatic Welder. Henry W. Roth, Ferndale, Mich., assigned to Multi-Hydromatic Welding & Manufacturing Co. Patent 2,033,851.

Tools and Attachments

Jig Clamping Device. Frank J. Ross, Detroit, Mich. Patent 2,033,303.

Indicator Gear for Measuring Instruments and the Like. Huge Abramson, Lidingo, Sweden. Patent 2,033,318.

Gear Cutter. Bertrand D. Marshall, Detroit, Mich., assigned to General Motors Corp. Patent 2,033,384.

Guard for Punch Presses. William A. Wiesman, Dayton, Ohio. Patent 2,033,501.

Guard for Punch Presses. William A. Wiesman, Dayton, Ohio. Patent 2,033,502.

MEETINGS

AMERICAN GEAR MANUFACTURERS ASSOCIATION. Annual Convention, April 20–21, Adelphia Hotel, Philadelphia, Pa. J. C. McQuiston, manager-secretary, Penn Lincoln Hotel, Wilkinsburg, Pa.

MIDWEST POWER ENGINEERING & POWER EXPOSITION. April 20–24, Palmer House and International Amphitheatre, Chicago, Ill. G. E. Pfisterer, manager, 308 West Washington St., Chicago, Ill.

NATIONAL OIL BURNER SHOW. April 14–18, Convention Hall, Detroit, Mich. Harvey Porter, managing director, Oil Burner Institute, Inc., 30 Rockefeller Plaza, New York, N. Y.

SOCIETY OF AUTOMOTIVE ENGINEERS, INC. Tractor & Industrial Power Meeting, April 15–16, Milwaukee, Wis. National Production Meeting, April 21–24, Detroit, Mich. Summer Meeting, May 31–June 6, White Sulphur Springs, W. Va. John A. C. Warner, secretary and general manager, 29 West 39th St., New York, N. Y.

NATIONAL METAL TRADES ASSOCIATION. Thirty-eighth Annual Convention, April 22–23, Waldorf-Astoria Hotel, New York, N. Y. Harry S. Flynn, secretary, Peoples Gas Bldg., Chicago, Ill.

AMERICAN MANAGEMENT ASSOCIATION. Production Conference, April 16–17, Statler Hotel, Cleveland, Ohio. Alvin E. Dodd, executive vice-president, 330 West 42nd St., New York, N. Y.

SPRING MANUFACTURERS ASSOCIATION. Annual Convention, April 18. Hotel Commodore, New York, N. Y. L. A. Wheeler, secretary, Bristol, Conn.

Motors AND OTHER MATTERS

Car output spurred by mild weather . . Two months' sales near all-time peak . . . Truck sales reach a new record . . . Tooling gets underway . . Die shops expect busy months soon . . . No radical designs seen

BURNHAM FINNEY
Western Editor

DETROIT—Mild weather has been the tonic needed by the automobile industry to give production new vigor. When the northern half of the country was drifted with snow, manufacturers and dealers were glum; today, orders are pouring in from all sections and enthusiasm has replaced pessimism. One company received over 8,000 orders in a single day the past week; its maximum productive capacity is 12,000 a week.

The industry is bullish. Passenger car sales in January and February are estimated at 375,782 units, compared with 307,250 in the same months of 1935, nearing the all-time highs of 1929 and 1930.

Truck sales are even more impressive. The January and February total was 82,000 units, a new record by far. Manufacturers predict a sales gain of 15 to 20 per cent during the first six months.

April-May Peak

For the first 10 days of March a leading car maker sold 32,009 units, as against 22,000 for the same period in 1935. Car production is expected to attain the year's peak in April, although delayed buying in February may carry over the top rate into May. Both April and May appear good for assemblies well over the 400,000 mark.

An important company in the low-price market, now figuring its sales year from November 1 to October 31, is counting on selling 65 per cent of its year's total before July 1. If it can do this, it anticipates no trouble in disposing of the remaining 35 per cent prior to the end of the model year.

It may come as a surprise to learn that several high executives are predicting "off the record" that it may be only a matter of a year or two until the industry edges back to January introductions.

The explanation is simple. Employment has been somewhat stabilized, but the fall plan has imposed a back-breaking burden on dealers, who must carry a peak stock of used cars for 90-days. With January announcements, used car stocks start to rise early in the year, reaching the top point in March or April and then beginning to dip almost immediately.

Tooling Has Started

A year ago Ford was speeding along in first place in car registrations, maintaining a tremendous lead over Chevrolet, which was handicapped by inability to secure "turret" tops. Today the situation is reversed, although Chevrolet isn't in front by so wide a margin as Ford was in 1935. How Chevrolet has come forward with a rush is illustrated by the fact that it accounted for over 54 per cent of the industry's increase in passenger car registrations thus far reported for the current year.

Tool and die programs for 1937 are getting under way. Car manufacturers and body builders are first filling up their own die shops before letting out work to jobbing plants. Chevrolet, Buick, Pontiac, Packard and Briggs Mfg. Co. are among the companies which have launched comprehensive programs. It is expected that die shops around Detroit won't begin to get the "overflow" business until around April 1. Most of them currently are pretty flat, but are confident that when orders start rolling in they will be steadily busy until early fall.

Die work thus far placed gives no indication of radical departures in car design for next year. So far as exterior appearance is concerned, there will be a lengthening out of the tail of the car in the streamline style of the Airflow and Lincoln-Zephyr. No freakish car is yet on the horizon, and no rear-engine cars are in sight.

Machine tool orders have been numerous. Oldsmobile has tentatively allotted new equipment costing around $500,000 for machining its 1937 six-cylinder engine block. There will be some improvements in the Olds six motor necessitating further purchase of new machinery. Chevrolet has bought a substantial amount of equipment at Flint, including 10 diamond boring machines. Further orders are pending. The local Chevrolet gear and axle plant also is expected to be in the market shortly. Chrysler's Jefferson Avenue plant in Detroit is negotiating for machine tools for its motor machining department. The Ternstedt Mfg. Co. is reported to have contracted for a number of small presses.

Packard Plans New Six

Packard, having achieved notable success with its 120 line, is understood to have bought equipment for a new six-cylinder car which probably will be introduced at the beginning of the 1937 season. This car, according to reliable reports, will have a number of parts interchangeable with the 120, but will be priced considerably under the latter. Some of the orders for this job consists of rebuilding existing equipment.

Ford is said to have hanging fire a machinery order totaling close to $400,000. However, no large program is pending at Dearborn and nothing spectacular in equipment purchases is looked for in the near future. Ford has about completed a far-reaching program of modernizing and expanding the capacity of the Rouge plant which called for expenditure of tens of millions of dollars through the last four depression years. While not contemplating a buying "program," one should remember that Ford always is in the market for cost-saving machinery and its purchases this year no doubt will match those of any other company when the 1936 total is computed.

Hupp Reorganization

Plans are afoot to reorganize the now moribund Hupp Motor Car Corp. by providing new working capital. The company is still in the federal courts through the efforts of interests long identified with the management to oust Archie Andrews. An announcement concerning reorganization may be made in the next few weeks.

PERSONALS

GEORGE L. ERWIN, JR., sales manager of Kearney & Trecker Corp., 6784 West National Ave., Milwaukee, Wis., has resigned.

JAMES A. TAYLOR, president of the Hartford Machine Screw Co., Hartford, Conn., has been elected a director of the Spencer Turbine Co.

A. R. GLANCY, SR., formerly a vice-president of General Motors Corp., Detroit, Mich., has been elected chairman of the National Tool Co., 11200 Madison Ave., Cleveland, Ohio.

WALLACE G. IMHOFF, president, Wallace G. Imhoff Co., Vineland, N. J., has been made technical director of research of the American Hot-Dip Galvanizers Association, Inc., American Bank Bldg., Pittsburgh, Pa.

PHILIP JOHNSON has been elected vice-president in charge of manufacture of Kenworth Motor Truck Corp., Seattle, Ore., gasoline and diesel truck builders. He resigned recently from the Boeing Airplane Co.

DONALD P. HESS, executive to the president of Timken Roller Bearing Co., Canton, Ohio, has resigned to become vice-president of Ebco Mfg. Co., Columbus, Ohio, manufacturer of metal cabinets, partitions and plumbing fixtures. He joined the Timken company as assistant factory manager in 1919.

CHARLES A. MOORE, chairman of Manning, Maxwell & Moore, Inc., 101 East 41st St., New York, N. Y., crane, hoist and machine tool manufacturers, has been elected chairman of the Electric Hoist Manufacturers' Association, succeeding C. O. HEDNER, Yale & Towne Mfg. Co., 4531 Tacony St., Philadelphia, Pa. A. S. WATSON, vice-president, Detroit Hoist and Machine Co., Clay Ave. & G.T.R.R., Detroit, Mich., has been elected vice-chairman of the association, of which E. DONALD TOLLES is secretary-treasurer, with offices at 165 Broadway, New York, N. Y.

W. OTTO WINTER, manager of the small tools division, Whitman & Barnes, Inc., 2056 West Fort St., Detroit, Mich., was elected chairman of the Detroit chapter of the American Society of Tool Engineers on March 12 to succeed T. B. Carpenter, Pioneer Engineering Co. ANDREW E. RYLANDER, Midland Steel Products Co., was elected secretary, and WILLIAM SMILA, master mechanic, Jefferson Ave. plant of the Chrysler Corp., was chosen treasurer.

H. T. MOORE has been named president of Tuthill Spring Co., 760 West Polk St., Chicago, Ill., succeeding the late FRANK H. TUTHILL. For the past five years Mr. Moore, who has been with the company 20 years, has been vice-president.

BUSINESS ITEMS

Pratt Industries, Inc., has taken over the entire business of the Pratt Chuck Co., Frankfort, N. Y., Winthrop T. Scarritt, president and treasurer, announced. The latter company went into receivership in September, 1932, but has continued operations. Extension of plant is planned.

Industrial Washing Machine Corp., New Brunswick, N. J., has been formed to manufacture washing, rinsing and drying machines for the metal industry, and equipment for bakeries, Ryan Sadwith, president, announced. Mr. Sadwith is vice-president of Ross Industries Corp. H. H. Ball, secretary, is in charge of designing equipment and of sales.

Continental Motors Corp., Detroit, Mich., has bought the farm lighting division of Westinghouse Electric & Mfg. Co. The manufacture of lighting equipment will be done in the Muskegon, Mich., plant of the company. About 100 additional men will be employed.

Bryant Machinery & Engineering Co., 400 West Madison St., Chicago, Ill., has appointed Hutton H. Haley & Associates, 2832 East Grand Blvd., Detroit, Mich., exclusive agents in the Detroit territory for Kling heavy duty grinders.

Physicists Research Co., 337 South Main St., Ann Arbor, Mich., has been organized by Ernest J. Abbott, formerly research physicist, University of Michigan, and associates. The firm's specialty will be "the solution of unusual industrial problems," its announcement says.

Lincoln Electric Co., 13010 Coit Rd., Cleveland, Ohio, has moved its Pittsburgh, Pa., office and show room to larger quarters at 926 Manchester Blvd. F. M. Maichle is district manager.

R. G. HASKINS Co., flexible shaft machine maker, has appointed Fred H. Ladd, Portland, Ore., distributor in the Northwest.

L. C. Biglow & Co., 250 West 54th St., New York, N. Y., has appointed John W. Blackford, Detroit, Mich., district manager in charge of the bearings department. He was formerly associated with the ball bearing division of the Torrington Co., Torrington, Conn.

Table I—Index of Orders

Based on Volume of Shipments for 1926

Month	Index of Orders: Domestic	Foreign	Total	3 Months' Average Index	% Foreign to Total Orders
1935—May	57.3	16.0	73.3	67.1	21
June	75.5	15.6	91.1	76.7	17
July	82.5	37.3	119.8	94.7	31
August	78.2	47.6	125.8	112.2	37
September	54.1	25.9	80.0	108.5	32
October	79.5	23.4	102.9	102.9	23
November	79.2	19.4	98.6	93.8	19
December	78.1	20.2	98.3	99.9	21
1936—January	95.7	15.1	110.8	102.6	14
February	99.8	12.3	112.1	107.1	11

Table II—Distribution of Orders

Average Indexes of Individual Companies	Companies in Per Cent of Total Number Reporting: 1935, by Quarters: 1st	2nd	3rd	4th	1936: January	February
200–up	4.2	5.8	14.2	11.3	14.3	13.1
100–199	12.5	15.8	22.1	24.3	23.8	23.0
60–99	16.9	22.0	17.2	21.7	22.5	16.0
20–59	39.6	31.2	31.6	27.7	27.2	29.8
Less than 20%	26.8	25.2	14.9	15.0	12.2	18.1
	100.0	100.0	100.0	100.0	100.0	100.0

Machine Tool Index Stronger, Reaches 112

The National Machine Tool Builders' Association index of machine tool orders rose to 112.1 in February, the highest point reached since last year's high of August. An increase of about 5 per cent in domestic orders more than offset a decline in the index of exports.

The index of domestic orders for February was 99.8, the highest in twelve months, in spite of lowered production among metal-working industries.

Mesta Machine Expands Manufacturing Facilities

Mesta Machine Co., Pittsburgh, Pa., has started a $750,000 expansion program, to add 20 per cent to its finishing capacity. The new building adjoins the plant. President Lorenz Iversen said the addition would be in operation in about a month's time. He reported that the company is operating three eight-hour shifts, seven days a week.

The plant at Homestead, Pa., is above the flood level, and suffered no damage. Operations were delayed only slightly; the plant generates its own power, has a large independent water supply and ample coal.

OBITUARIES

NELSON AUGUSTUS GLADDING, 72, vice-president of E. C. Atkins Co., Indianapolis, Ind., saw manufacturers, died suddenly in Portland, Ore., March 8, while on a business trip. A former president of the American Hardware Manufacturers Association, he was elected president of the American Supply and Machinery Manufacturers Association in 1914 and again in 1919.

WILLIAM L. DEMING, president Deming Co., pump and machinery manufacturers, died March 8 at 84.

GRANT MORRISON, president and treasurer of the Bay City Iron Works, Bay City, Mich., died March 9 at 71.

ARTHUR E. ROBINSON, founder and president of the Regal Gasoline Marine Engine Co., Coldwater, Mich., died March 5 at the age of 77.

ALFRED O. DUNK, a pioneer in the automotive industry and former president of the Detroit Electric Car Co., Detroit, Mich., died March 5.

H. B. SWINGLEHURST, 68, president of Scott & Williams, knitting machinery manufacturers, 366 Broadway, New York, N. Y., died March 15 in Boston.

FRANK A. BALDWIN, president of the Oliver Machinery Co., Grand Rapids, Mich., died at his home on March 7 after two weeks' illness. He was 82.

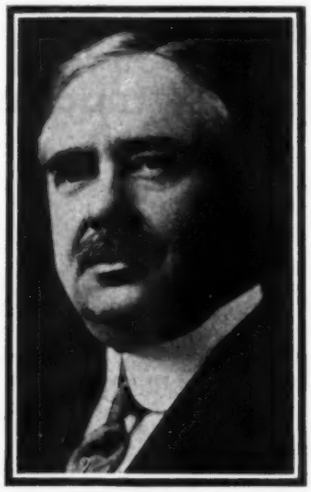
CLYDE A. HAEFNER, vice-president of the Detroit Harvester Co., died Feb. 25.

J. STEWART BROWN, who for 35 years had been president of Brown & Co., Pittsburgh, Pa., iron works and machine builders, died March 12 at the age of 85.

JAMES F. LOUCKS, vice-president and chief engineer of Universal Metal Section Co., Cleveland, Ohio, died March 14, at the age of 59. He had been connected with Brown-Hoisting Machinery Co. in manufacturing executive positions, and later founded the Holorib Co., which was merged with Detroit Steel Products Co.

MILES W. O'BRIEN, president of the South Bend Lathe Works, South Bend, Ind., died March 20. He was 64. He and his brother, John J., founded the company in 1906.

Headed Machinery Associations



NELSON AUGUSTUS GLADDING

Plan "Welding Clinics" In West Coast Cities

Welding experts of the International Nickel Co., the Aluminum Co. of America, and Revere Copper & Brass Co., will conduct a series of "welding clinics" during April in four West Pacific Coast cities, to demonstrate the best methods for welding non-ferrous and surfacing materials. Both the arc and oxy-acetylene methods will be demonstrated in Vancouver, B. C., Seattle, Wash., San Francisco, and Los Angeles, Calif.

Industrial Review

• DESPITE decidedly adverse weather conditions in several sections of the industrial area, machine tool sales during March have held up well on the average. Losses in one sector have been offset by gains in other ones just as floods in Pennsylvania, Ohio and the Connecticut Valley have been countered by drought and dust storms in St. Louis and blizzards in Cleveland and Buffalo. There should be a silver lining to the flood cloud for machinery men because some, at least, of the submerged machinery will probably be scrapped and replaced by new units.

• CONDITIONS in the eastern territory are uneven. A lull in New England is reported but New York and Philadelphia are both finding March a pretty good month. Letters from Pittsburgh, sent before the inundation, report a more active interest in new equipment than at any time in the past ten years. In Cleveland the high level of business activity in the first week of March was not maintained thereafter although distributors have high hopes for a recovery when spring finally comes.

• VOLUME of machine tool and supply sales in Detroit dropped off somewhat in March from a none too satisfactory February figure but hopes for improvement are strong and are based on the fact that tool and die contracts have been let by the automobile companies. Supply sales are trending upward and there are some big machinery programs in the offing. Employment in the automotive parts plants is gaining in Toledo as is employment by the railroad companies. March business is well ahead of the March business of last year. Indianapolis is looking for a fair volume of machine tool orders in March and a satisfactory diversification of industrial customers.

• FLOODS have handicapped communications in Cincinnati and are probably partly responsible for the slight decrease in machine tool business reported in that area. The general situation is encouraging and inquiries are fair. In St. Louis there is a PWA strike of union men but this disturbance has apparently had little effect on the machinery business which was better than the February record. Extremely dry weather is raising fears of subsequent dust storms. In Chicago the machine tool business continues to be good and there is reason to believe that the February total may be exceeded. Inquiries are good and prospects excellent.

Machine Requirements and Industrial Construction

EQUIPMENT WANTED

Conn., East Haven—Town, R. W. Foote, Chamber of Commerce Bldg., New Haven—lathes, drills, presses, bench tools, etc., for manual training department for school.

Mass., Boston—Rush Fish Co., 40 Fish Pier, J. T. Rush—electric welding machine, alternating current or engine attached.

Mass., Springfield — Col. T. J. Smith, Commanding Officer, Springfield Armory, will receive bids until Apr. 1 for 10 hand milling machines***Apr. 3 for one direct connected synchronous motor driven air compressor***Apr. 6 for one vertical wood borer***Apr. 7 for one jig boring machine, two 12 in. and two 24 in. motor driven shapers***Apr. 8 for one high speed steel electric furnace, one portable flexible shaft rotary filing machine.

Miss., Vicksburg—Lt. Col. L. E. Oliver, Dist. Engr., U. S. Engineer, Office P. O. Box 667, will receive bids until Apr. 3 for two 400 amp. motor driven electric welding machines, portable truck type.

N. Y., Bolivar—Runyan & Reynolds Oil Co.—machinery and equipment for power plant, including gas engine, well pumping power, wrenches, drills and other small tools.

N. Y., Buffalo—M. Park, 210 Merrimac St.—metal working lathe.

N. Y., Gouverneur—M. A. Moore, 44 Barney St.—9 to 14 in. precision screw cutting lathe, lawn mower sharpening machine, key machine, swivel, vise, taps and dies.

N. Y., Jamestown—Nelson Bros., 40 Market St.—machinery and equipment for planing mill.

N. Y., Rome—Board of Education, G. R. Staley, Supt.—vocational equipment for continuation school to include 14 woodworking and metalworking machines, 1 milling machine, vises, drills and tools. Estimated cost $6,872.

N. Y., Syracuse—J. R. Clancy, Inc., 1000 West Belden Ave., G. L. Scherrer—milling machine and spot welder.

O., Bucyrus—Zenith Mfg. Co., A. W. Sieglaff, Mgr.—machinery and equipment for plant for manufacture of automobile engine parts.

O., Cleveland — City, Frank Milton, Purch. Agent—pipe threading machine for Department of Public Utilities.

O., Dayton—U. S. Air Corps, Contracting Office, Wright Field, will receive bids until Mar. 27 for 3 internal radial aircraft cylinder grinders, 12 motor driven milling machines, 10 honing and lapping machines, motor driven, and 15 fixtures.

O., Zanesville — Wise Foundry, Machine & Supply Co., L. H. Wise, Pres., Treas. & Mgr.—machine shop equipment to replace that recently destroyed by fire.

Pa., Bethlehem—G. T. McCarthy, 631 Bethlehem Hotel Bldg.—one 24 in. shaper; 12x36 in. surface grinder; 24 in. rod drill; 12x36 in. miller; 16x96 in. lathe; 12x18 in. forming press; 12 to 20 in. O.T. shear.

Pa., Conshohocken — Conshohocken Pattern Works—master aluminum melting furnace.

Pa., Erie—Louis Marx Co., L. C. Feist, Mgr., 1015 West 19th St.—equipment for toy factory.

Pa., Exeter — Stevens Colliery, Slocum St., Thomas Carey, Mgr.—transmission and conveying equipment and machinery for new coal tipple.

Pa., Philadelphia—Dixon Valve & Coupling Co., Columbia and Hancock Sts.—riveting machine, ½ in. capacity, also 48 in. wrench.

S. C., Charleston — U. S. District Engineer, Col. W. G. Caples, Purch. Agt., Custom House, will receive bids until Mar. 31 for 1 portable gasoline driven arc welding machine, 300 amp. mounted on steel wheels, with welding helmets with cover glass and 3 sets of lenses; 2 inspection sheets with cover glass and 3 sets of lenses; 2 electrode holders each with 5 ft. extra flexible asbestos or equivalent cable; 200 ft. flexible rubber-covered cable and 3 steel wire scratch brushes for cleaning.

N. B., Apohaqui—I. S. Brown—6 in. four sided moulder.

N. B., St. John—Roy Saunders, 58 Union St.—chain, blocks and electric drill.

OPPORTUNITIES FOR FUTURE BUSINESS

Ark., Crossett — Crossett Lumber Co. has awarded the contract for the construction of a kraft pulp and paper mill. Esimated cost $4,000,000.

Calif., Beverly Hills—Payne Furnace & Supply Co., 338 North Foothill Rd., will soon take bids for the construction of a factory and office addition. Estimated cost to exceed $37,500. W. J. Gage, 468 North Camden Dr., Archt.

Calif., Pomona — Pomona Pump Co. has awarded the contract for an addition to its factory. Estimated cost $37,000.

Calif., San Diego — Consolidated Aircraft Corp., 3302 Atlantic St., is having plans prepared by Taylor & Talyor, Archts. and Engrs., 803 West Third St., Los Angeles, for the construction of a 1 story, 200x200 ft. factory with 100x125 ft. wing. Estimated cost $150,000.

Calif., San Francisco—City and County of San Francisco has awarded the contract for the construction of a machine shop for school at Geary Blvd. and 32nd Ave. Estimated cost $120,987.

Calif., Santa Monica—Douglas Aircraft Co., 3000 Ocean Park Blvd., will construct a 1 story, 300x300 ft. addition to its factory. Estimated cost $100,000. Taylor & Taylor, 803 West Third St., Los Angeles, Archts. and Engrs.

Conn., Ansonia—S. O. & C. Co., 520 Main St., subsidiary of United Shoe Machinery Co., has awarded the contract for an addition to its factory. Estimated cost $40,000.

Conn., Bridgeport—Bryant Electric Co., Hemco Division, State St., has awarded the contract for a 1 story factory on Railroad Ave. for the manufacture of plastic mouldings. Estimated cost $80,000. Noted Jan. 15.

Conn., Bridgeport — International Harvester Co. of America, 320 North Ave., plans to construct a motor truck service station on Fairfield Ave. Estimated cost $60,000.

Ill., Chicago — Chicago Flexible Shaft Co., 5600 West Roosevelt Rd., plans to construct a 1 story factory. S. N. Crowen & Associates, 30 North LaSalle St., Archts.

Ill., Chicago—Illinois Tool Corp., 2501 North Keeler Ave., has awarded the contract for the construction of a 1 story, 107x119 ft. factory. Estimated cost $45,000.

Ill., South Chicago — Republic Steel Corp., R. J. Wysor, Vice Pres. and Genl. Mgr., Republic Bldg., Cleveland, O., will construct a wire mill. Estimated cost $1,000,000. C. A. Thayer, Ch. Engr.

Ill., Summit—L. A. Young Spring & Wire Co., 6601 South Oak Park Ave., plans to construct an addition to its factory.

Ind., Alexandria—Alexandria Products Co., manufacturer of metal specialties, contemplates repairs to its plant here. Estimated cost $37,000. Maturity indefinite.

Ind., Indianapolis—American Can Co., 230 Park Ave., New York, N. Y., plans to construct a factory here. Estimated cost $150,000.

Ind., Indianapolis—Indiana Wheel & Rim Co., North Illinois St., contemplates repairs to its factory here. Estimated cost including equipment will exceed $40,000.

Md., Baltimore—Owens Illinois Can Co., 2809 Boston St., has awarded the contract for alterations and additions to its factory. Estimated cost $30,000.

Mass., Malden — F. H. Robertson Co., 370 Bway., has awarded the contract for the construction of a 1 story, 25x60 ft. factory building for the manufacture of tools and will be in the market for machinery.

Mich., Detroit — Detroit Vapor Stove Co., Kercheval and Connors Aves., will soon award the contract for the construction of a 1 and part 2 story, 70x300 ft. factory. Estimated cost $45,000.

Mich., Grand Rapids—Leonard Refrigerator Co., Grand Rapids, has awarded the contract for an addition to its factory. Estimated cost $45,000.

Mich., Marysville—Chrysler Corp., 341 Massachusetts Ave., Detroit, has awarded the contract for an addition to its factory here. Estimated cost $50,000.

Mo., St. Louis — Cupples-Hesse Envelope & Lithographing Co., E. H. Harms, Pres., 4173 North Kingshighway Blvd., has awarded the contract for a 2 story, 120x173 ft. factory addition.

Mo., St. Louis—Johnston Tin Foil & Metal Co., 6008 South Bway., will soon award the contract for the construction of a 2 story, 102x117 ft. factory at Bway. and Bowen St.

N. Y., Buffalo — Keith R. Wilson Foundry Co., 10 Lock St., manufacturer of automobile parts, plans to rebuild its plant recently destroyed by fire. Estimated cost including new equipment $150,000.

N. Y., Troy—Burden Iron Co., Troy, plans to enlarge its factory for the manufacture of certain articles in which light alloys and stainless steel will be used. All necessary machinery will be purchased by Alfred Musso.

O., Cleveland—Republic Steel Corp., R. J. Wysor, Vice Pres. and Genl. Mgr., Republic Bldg., will rebuild the blast furnaces and improve the dock and ore loading facilities at its Corrigan-McKinney plant here. Estimated cost $1,300,000. C. A. Thayer, Ch. Engr.

O., New Philadelphia — Tuscarawas Metals, Inc., Dover, has acquired the mill formerly occupied by the American Sheet & Tin Plate Co., and will alter and recondition same for its own use. Estimated cost will exceed $37,000.

O., Youngstown — Cold Metal Process Co., manufacturer of rolling mill equipment for steel plants, plans to rebuild its plant here recently destroyed by fire with a loss of $500,000.

O., Youngstown—Republic Steel Corp., R. J. Wysor, Vice Pres. and Genl. Mgr., Republic Bldg., Cleveland, plans improvements to its tube mill, coke plant, open hearths and transportation facilities here. Estimated cost $200,000. C. B. Thayer, Republic Bldg., Cleveland, Engr.

Pa., Altoona—Brumbaugh Body Co., 3031 6th Ave., C. Brumbaugh, Pres. and Mgr., has awarded separate contracts for rehabilitating and installing new equipment in the factory at 600 Logan Ave. which will be used for the manufacture of auto bodies. Noted Feb. 26.

Pa., Latrobe — Latrobe Electric Steel Co., 2626 South Ligonier St., is having plans prepared for a 1 story, 60x380 ft. addition to its plant.

Pa., Lewisburg — Prison Industries, Inc., Wash., D. C., plans to construct a 3 story, 62x202 ft. factory for the manufacture of metal furniture, at the Federal Prison here. Metal working machinery and equipment will be required as well as chrome plating and nickel plating equipment. Estimated cost $65,000. H. C. Hill, Warden.

Pa., Uniontown—Goldberg Iron & Steel Co., Pennsylvania Ave., contemplates the construction of a 1 story sheet metal machine shop and main building. Estimated cost $30,000.

Pa., Washington—Washington Tin Plate Co. has awarded the contract for the construction of a 100x164 ft. tin plate mill.

Wash., Aberdeen—A. R. Wuest, 303 West 9th St., plans to construct a plywood plant. Estimated cost $500,000.

Wash., Seattle—Western Gear Works, 417 9th Ave., So., have awarded the contract for an addition to their plant. Estimated cost $40,000.

W. Va., Clarksburg—National Can Co., 110 East 42nd St., New York, N. Y., plans improvements to its plant here. Estimated cost $40,000.

Wis., Waukesha—Freeman News, 259 South St., is having plans prepared by J. P. Bruecker, Archt., 1581 North Prospect Ave., Milwaukee, for the construction of a 2 story, 41x114 ft. printing plant.

Ont., Brantford—Crown Electrical Mfg. Co., Ltd., J. O. M. Trepanier, Mgr., plans to construct a plant for the manufacture of electrical supplies. Estimated cost $50,000.

Ont., Oshawa — The Oilless Leakproof Compressor Co., Ltd., Russell D. Humphreys, Pres., plans to construct a plant for the manufacture of compressors and parts. Estimated cost $30,000.

Ont., Three Rivers—Canadian International Paper Co., Ltd., 220 East 42nd St., New York, N. Y., plans to construct an addition to its plant here. Estimated cost $400,000.

Que., Valleyfield — Canadian Bronze Powder Works, Ltd., 1102 University St., Montreal, have awarded the contract for the construction of a machine shop. Estimated cost $16,000.

American Machinist REFERENCE BOOK SHEET ©

Pressed Parts for Porcelain Enameling

Abstracted from the "Handbook on Design of Metal Parts for Porcelain Enameling," published January 1936 by the Technical Research Section, Educational Bureau, Porcelain Enamel Institute.

Correct design and fabrication of pressed-steel shapes for porcelain enameling cannot be underestimated if excessive loss and resultant high cost are to be avoided in the enameling operation, in the assembly operation or in the field. Selection of the gage of metal, design of parts to prevent warpage, and proper design of tools and upkeep of fabricating equipment are all necessary to success.

No hard and fast rule can be laid down as to the size of parts that can safely be made from any given gage, but it is far better to err on the side of too heavy a metal than to use one too light. In the first case little or no trouble will be experienced in enameling or mounting, the only loss being the extra weight of metal used, while in the latter case, all the endless losses of enameling, mounting and field replacements may be encountered because of the warpage, sagging, hairlining and chipping developed through the use of a metal too light for the design in which it was used.

Below is given a table that may be used as a guide for the design of parts and moderate size, to be finished in white or light colors, where only moderate rigidity and flatness are required. Even for such parts as might be used on stoves and products of similar size, it should not be followed too literally. Parts so formed as to require the use of deep drawing stock, but still largely flat in appearance, are usually found more subject to warpage than if the design is such as to permit the use of ordinary enameling sheets. In such cases, recourse to heavier gages is usually an aid in overcoming the difficulty.

Heavier gages of metal, down to 14 gage for example, are frequently used in panels for the building industry, for plumbing ware and for signs.

The fabrication of parts to be porcelain enameled invariably involves the bending of the metal at an angle, usually a right angle, along one or more sides of the piece. This operation may be carried out as a drawing operation, where all four sides are flanged at once with closed corners; or on a forming press or brake, the corners being gas welded to rim bind the piece. When only one or two sides are flanged, the work is usually carried out on the forming press; welding being used, of course, only if two flanges meet.

Gages for Various Panel Sizes

Gage	*Width*	*Total sq.ft.*
24	6 in.	½ sq.ft.
24	12 in.	*3 sq.ft.
24	18 in.	*5 sq.ft.
22	6 in.	1 sq.ft.
22	12 in.	3½ sq.ft.
22	18 in.	*6 sq.ft.
22	24 in.	*8 sq.ft.
20	6 in.	1½ sq.ft.
20	12 in.	5 sq.ft.
20	18 in.	*8 sq.ft.
20	24 in.	*10 to 15 sq.ft.

*Should be embossed, flanged or otherwise suitably reinforced. All parts larger than indicated should be made from 18 gage or heavier metal.

Whatever the forming process, if the parts are to be enameled in white or light colors, the radii of the flanges should never be less than ⅜ in. Less than this radius results in burning off of the ground coat and cover enamels and difficulty in securing suitable coverage in finish. See Fig. 1.

From an appearance standpoint nothing is gained by smaller radii, since the difficulty experienced in securing proper coverage results in the application of so much finish enamel that the final appearance is the same, with a much increased tendency to chip. See Fig. 2. When a ground coat or dark colored finish only is to be applied, it is permissible to reduce the radii somewhat, but in no case should it be less than ⅜ in. even for dark colors, or trouble similar to that outlined above may be experienced.

In all cases of flanging on the forming press or brake, it is good practice to weld the corners where flanges meet. This reinforces the entire piece and prevents "working" or movement of the metal during mounting, and reduces danger of chippage to a minimum. Welding of corners may be dispensed with under certain conditions, such as on parts to be finished in black or dark colors or parts where the corners are not exposed. See Fig. 3.

Where embosses and offsets are used to overcome warpage or decorate a piece, care must be exercised to insure that they are symmetrical with the piece. The radii should not be less than the ⅜ in. designated for angles to be finished in white or light colors.

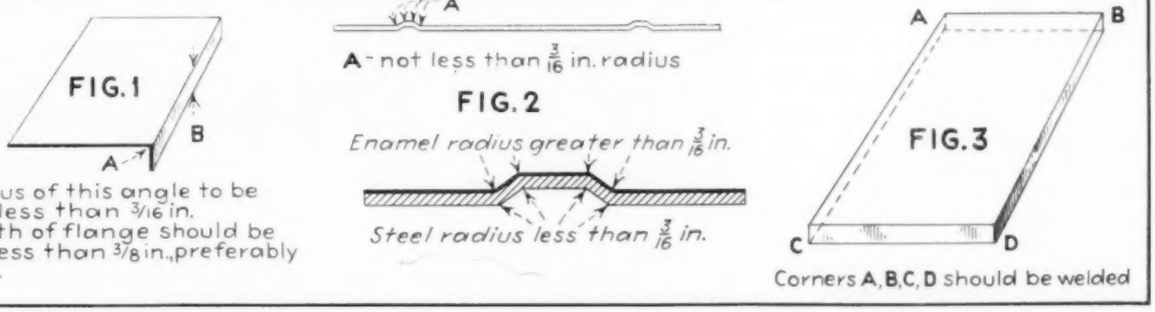


FIG. 1
A
B
A - radius of this angle to be not less than 3/16 in.
B - depth of flange should be no less than 3/8 in., preferably 1/2 in.
A
A - not less than 3/16 in. radius
FIG. 2
Enamel radius greater than 3/16 in.
Steel radius less than 3/16 in.
A
B
FIG. 3
C
D
Corners A, B, C, D should be welded

American Machinist
REFERENCE BOOK SHEET ©

Pressed Parts for Porcelain Enameling

Too frequently, this phase of stiffening offsets and embosses is overlooked, with a resultant loss in enameling operations. For successful enameling, the radii should never be less than in Fig. 2.

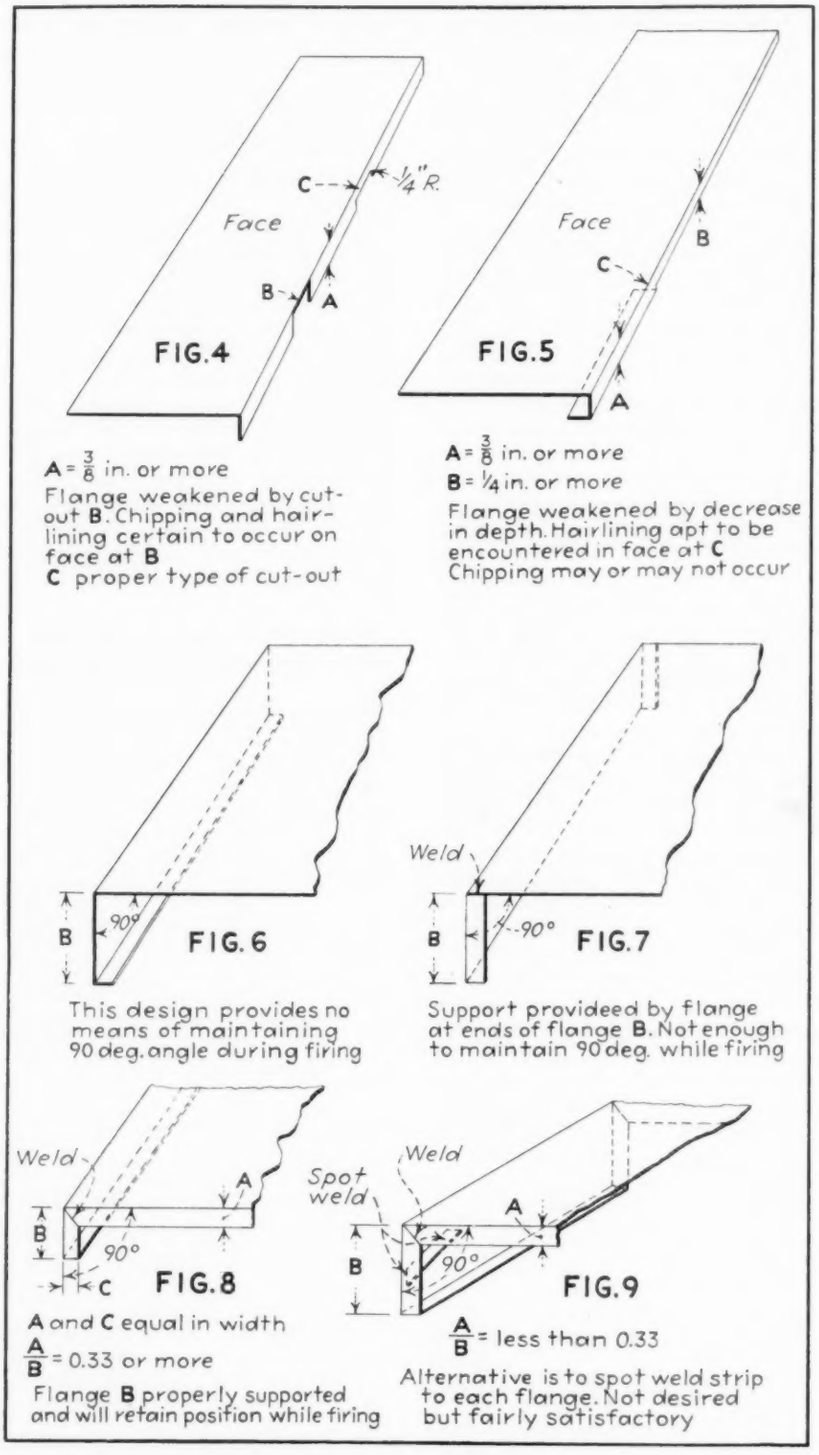
Flanges

Since flanges are essential if parts are to be kept flat and straight, their depth is important if the desired result is to be attained. Where used for this purpose, the depth should never be less than $\frac{3}{8}$ in., and if punched with holes for mounting, $\frac{1}{2}$ in. is a far more desirable minimum. Cutouts, notches and large holes ($\frac{7}{16}$ in. or larger) in flanges of this depth should be avoided if possible, as they weaken the flange at their location. Also all strains of handling are concentrated at that point, transmitted to the flat surface they are intended to reinforce, and damage to the ware too frequently results. See Figs. 4 and 5.

Where flange notches or cutouts cannot be avoided, the corners should conform to a $\frac{1}{4}$ in. or larger radius and the die used in making the cut set not too close in order to push the metal toward the inside of the flange along the edge of the notch or cutout. This "extruding" or "burring" of the edge of the notch, together with the radius corners, will strengthen the flange and minimize inherent weakness.

Where a large flange, 1 in. or more in width is visible at the final assembly, it is usually essential that it be kept entirely straight and at exact angle. This is very difficult to attain unless this flange is properly supported by some means during the enameling operation. By far the safest design is to have the flange meeting the exposed flange of equal depth, or at least in the ratio of exposed flange to side flange of 0.33. If this is impossible due to some feature of design, as an alternative, although not desirable, a light gage angle may be spot welded to both flanges as a reinforcement, but in no case should this angle be welded to the back of the surface to be finished. See Figs. 6, 7, 8 and 9.

The subject will be concluded in the next Reference Book Sheet.



Ideas FROM PRACTICAL MEN

Expansion Arbor for Turning Pistons

EDWARD L. PETERSON

To obtain uniform wall thickness of pistons for automotive engines it is necessary that the outsides and insides be concentric. For this purpose when turning pistons they are mounted on an expansion arbor, the jaws of which grip the insides.

Such an arbor is shown in the illustration and is made to screw on the spindle nose of the lathe. It has two sets of pin jaws made from drill rod, one set gripping the inside of the piston near the piston-pin bosses and the other set gripping the inside near the bottom of the skirt, each set acting independently.

The inner ends of the jaws are at an angle to match similar angles on the sliding members as at *A*. The sliding members are provided with studs *C* and *D* which engage helical grooves in the inner sides of the hubs of the handwheels *F* and *H*. It will thus be seen that rotating the handwheels on the arbor will move the sliding members and either expand or retract the jaws, according to the direction of rotation. While expansion of the jaws is positive, retraction is not.

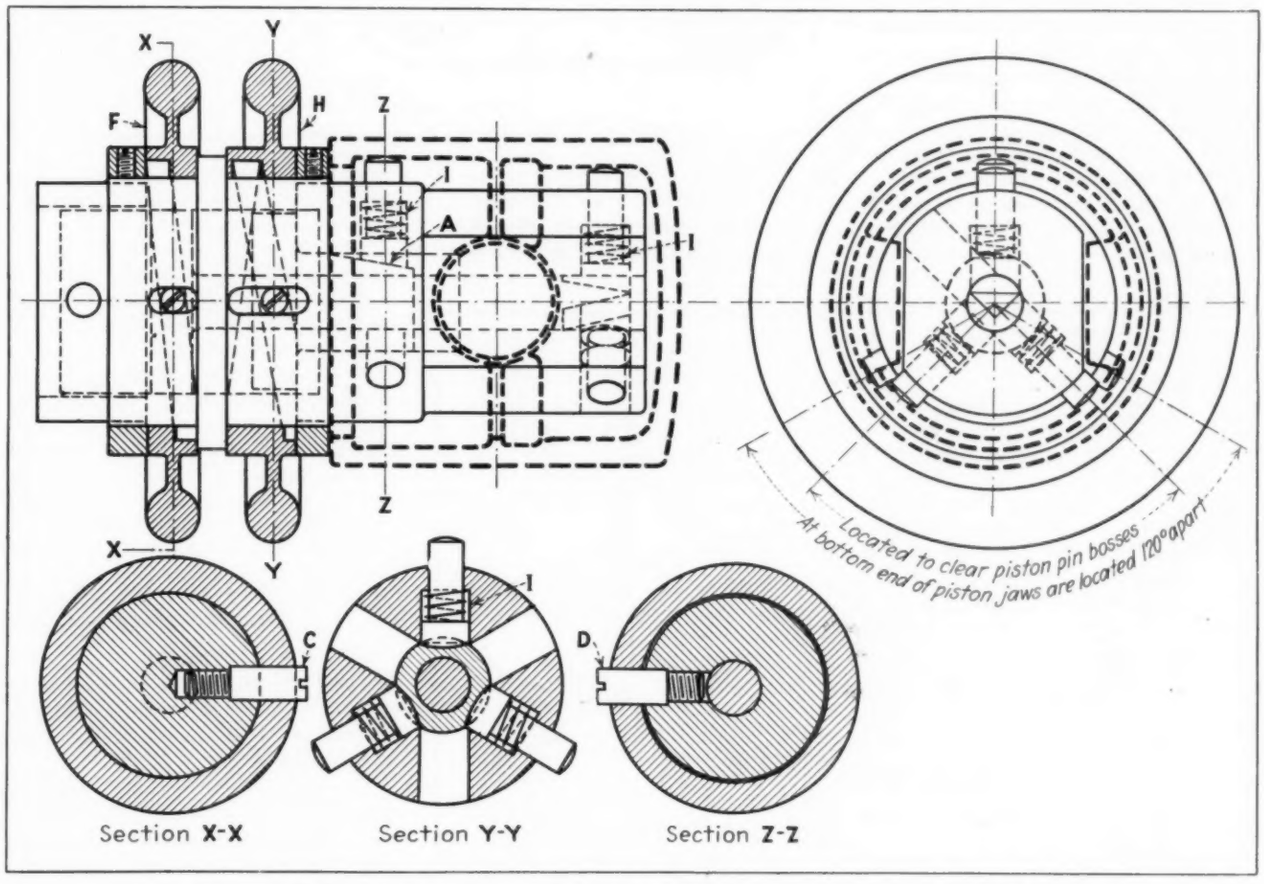
When the handwheels are rotated in the direction for retracting the jaws, the helical springs *I* on each jaw of both sets keep the jaws in contact with the sliding members and cause them to retract.

The jaws at the skirt end of the piston are spaced 120 deg. apart, but the spacing of the jaws at piston-pin end varies slightly from 120 deg. so that they will clear the piston-pin bosses. The outer end of the arbor is flatted on two opposite sides to go between the piston-pin bosses and insure that the piston will revolve with the arbor without slippage.

Improvised Cam Grinder

H. M. JAMES
James Machine Works

We had to recondition several camshafts belonging to small gas engines by grinding the cams sufficiently to clean them up and polish them. Since we had no cam grinder, we improvised the fixture illustrated for handling the job in an old automotive parts grinder.

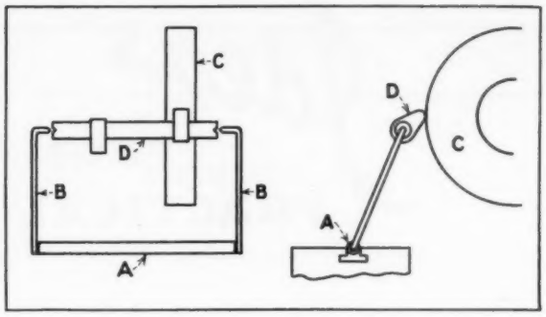


This expanding arbor has two sets of pin jaws that act independently. One set grips the inside of the piston near the piston-pin bosses and the other set grips it near the bottom of the skirt

A piece of shafting *A*, of such diameter as would drop part way into the T-slot of the grinder table, had long shanked centers *B* bent and welded to the ends, as shown, care being taken that the points were at an equal distance from the shafting.

All that was necessary was to spring the centers slightly apart and enter them into the center holes of the camshaft, place the shafting in the T-slot of the grinder table, let the cams bear against the abrasive wheel *C*, and revolve the shaft slowly by hand. The camshaft *D* oscillated from the shafting in the T-slot as a center.

Crude; yes, but the device enabled us to do a reasonably good job in a short time.



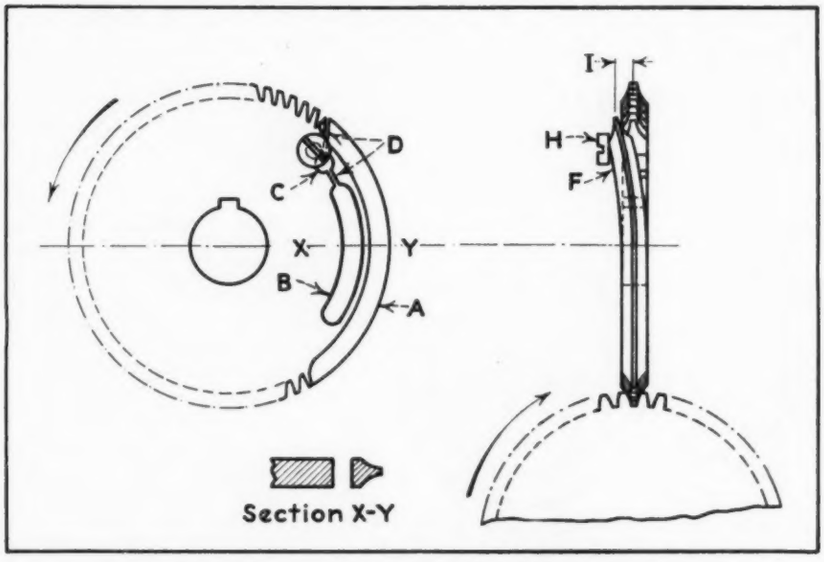
The camshaft was held between oscillating centers, the cams being held against the abrasive wheel by the weight of the shaft while the shaft was slowly revolved by hand

Cutter of Peculiar Design

PHIL. E. VERAA

The cutter shown is used by Swiss instrument makers to smooth the teeth of small gears. This cutter is in one piece, and while the part *A* has no teeth, it has the shape of the tooth space. The circular slot *B*, the hole *C* and the saw cuts *D* permit the part *A* to be sprung out of line, or offset at an angle, as at *F*. After the cutter has been hardened, part *A* is drawn to a spring temper and the amount of offset is regulated by the screw *H*, the correct amount of offset *I* being equal to the chordal pitch of the gear, the teeth of which are to be smoothed.

In operation, the mandrel on which the gear is mounted is held between centers so as to revolve freely, and the cutter is set to the correct depth. As the cutter revolves, the offset part passes through the adjacent tooth space and turns the gear one tooth at each revolution, acting as a single-thread worm. Since the offset part has no teeth, it cannot cut as it passes through the tooth space.

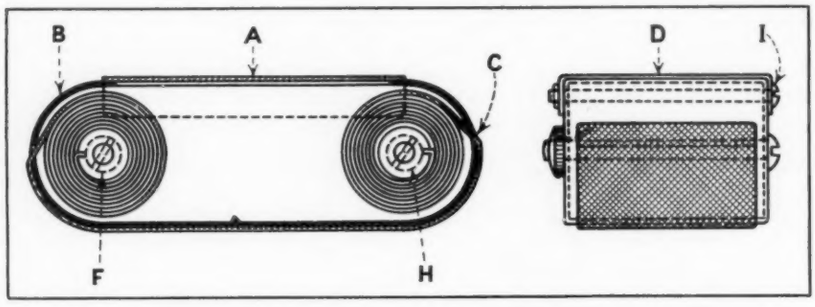


Part of the cutter is offset at an angle and has no teeth. It acts as a single-thread worm and turns the gear one tooth at each revolution

Refillable Polishing Block

JOHN A. HONEGGER

Illustrated herewith is a refillable type polishing block for polishing flat surfaces. Essentially it consists of a sheet-brass or aluminum shell *A* cut, bent and soldered to form the shape indicated and having slits at *B* and *C;* the cover *D;* the two spools *F* and *H;* and the necessary screws.



When the abrasive cloth becomes dull or glazed, a fresh portion is exposed by unwinding the strip from one spool and winding it onto the other

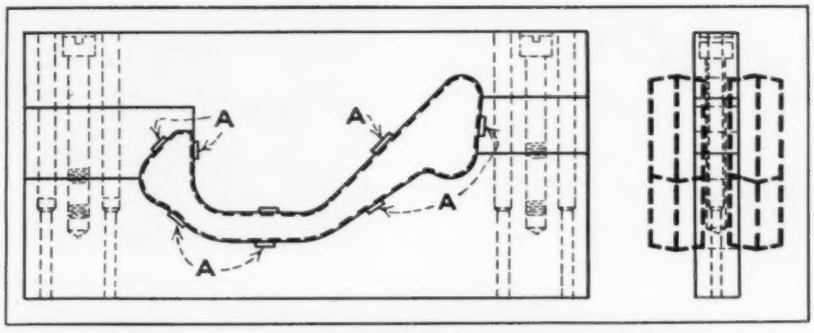
A strip of abrasive cloth of the proper width is wound on spool *H* and passes through the slit *C*, along the bottom of the block, through slit *B* and onto spool *F*. As the abrasive cloth becomes dull or glazed by use, a fresh portion is exposed by unwinding the strip from one spool and winding it on the other. Both spools are then locked by the thumbnuts shown to keep the strip taut. Screw *I* holds the cover on top of the block.

Comparator Gage for Drop Forgings

FRANK HARTLEY

There are few types of work more difficult to gage than those having offset surfaces that cannot be measured by ordinary means.

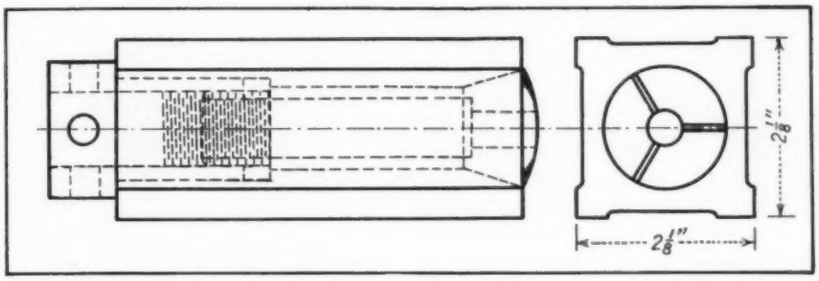
The gage illustrated is used for gaging the entire outline of the contour of the drop forging indicated by heavy dotted lines. The top and the bottom of the work are gaged separately in opposite sides of the gage, as shown in the end view. The purpose of this gage



This gage is used to compare drop forgings made in duplicate or triplicate dies. The tops and the bottoms of the forgings are gaged separately on opposite sides of the gage

is to compare drop forgings that are made in duplicate or triplicate dies.

The work should enter the gage not more than $\frac{1}{8}$ in. If it enters more than that, the forging will be too small to allow for machining and the dies will have to be corrected. To show the maximum amount of stock allowable on the work, notches *A* are cut at several points in the gage, so the inspector can see if and at what points the dies require correction. The gage is built in four parts for convenience in machining.



Block for Holding Spring Collets

CHARLES WESLOW

In the illustration is shown a rectangular block for holding spring collets. It is made of cold-rolled steel, pack-hardened and then ground all over and is made to fit the collets of the bench lathe or the bench miller. All four sides are relieved lengthwise so as to leave feet at the corners. It can be held either on the magnetic chuck or in the machine vise. The work is tightened in the collet by a short draw-in rod in the usual manner.

A collet held in such a block is convenient for holding small round work to have squares milled or ground on it. When the block is held in the machine vise on the miller, indexing for squares is quicker and easier than if the collet were held in the dividing head.

Labor cost of the job, including the fixture and the special stamp, was much less than the prices quoted by outside shops for the graduating alone

Squares can be milled or ground on round work held in a spring collet in this block, holding the block in the machine vise or on the magnetic chuck

Improvised Graduating Device

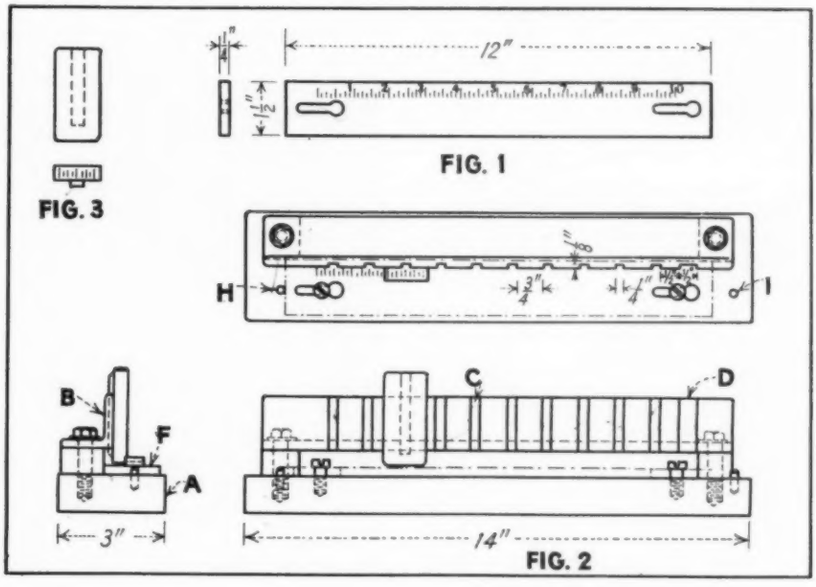
HERBERT M. DARLING
Superintendent, Wells Tool Company

A small jobbing shop recently received an order to make 50 graduated parts, as shown in Fig. 1. The machine work was a simple job, but the graduating presented quite a problem in a shop not fitted for such work. Several concerns were asked for bids on the graduating, but the prices quoted were prohibitive. Finally, the fixture shown in Fig. 2 was made, mostly from scrap.

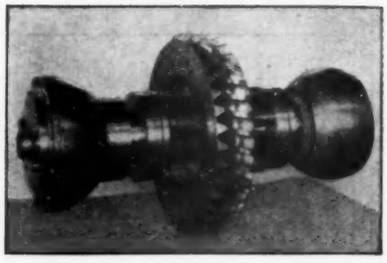
The base *A* is cast iron, planed on top. The angle iron *B* has ten ¼-in. vertical slots *C* milled in it and another slot, ½ in. wide, was milled at *D*. The stamp for the graduations, shown in Fig. 3, was made from tool steel and was milled to form the graduations, which were cut off to the different lengths with a small chisel. The back was milled to leave a tongue to fit the slots in the angle iron.

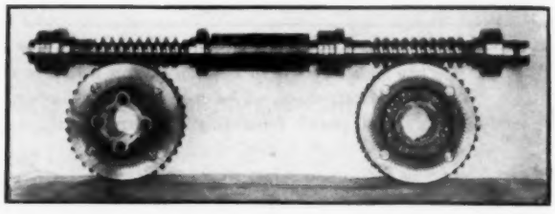
In use, the work *F* is mounted on the base, located by the stop pin *H* and held by screws. The stamp is held against the angle iron, the tongue engaging each of the slots in the angle iron in turn as the work progresses. A careful blow with a hammer marks 1 in. of graduations at each location. After marking the complete 10 in., the holding screws are loosened and the work is pushed against stop pin *I* and again fastened.

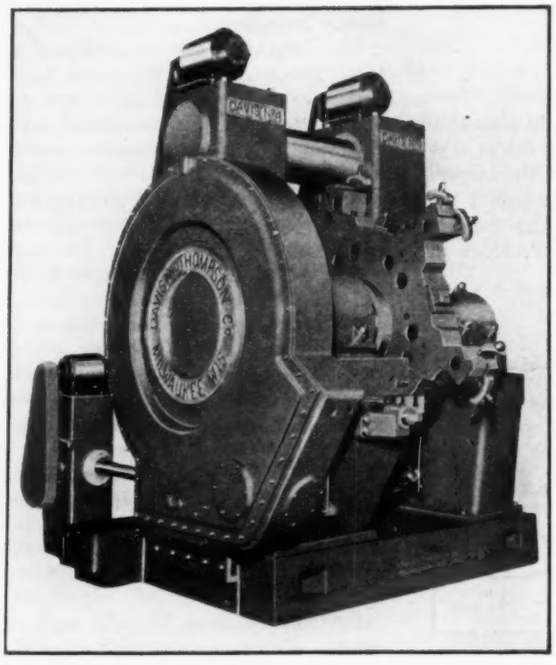
In this position, ¼-in. number stamps are used for numbering the inches by locating them in the slots in the angle iron. Two stamps are located in the ½-in. slot at the end to mark the numeral 10. Polishing the work removed all burrs.



Shop Equipment NEWS







Top—By using spherical bearings on the spindles, they can be aligned for desired toe cut

Center — Spindles are driven by worms, each having its own thrust bearing

Left—Cylinder blocks of various sizes can be milled on the Davis & Thompson No. 4 machine because of the adjustments provided

Davis & Thompson No. 4 Drum Type Milling Machine

A drum-type milling machine for cylinder blocks, built by the Davis & Thompson Co., 6619 West Mitchell St., Milwaukee, Wis., can be adjusted to take longer or shorter blocks as required. On the No. 4 machine, the spindles can be adjusted endwise. Moreover, the lower spindles of the machine, which are the finishing spindles, have spherical bearings and are adjustable for toe cut to give the desired finish to the work.

The left-hand housing, which supports the roughing and finishing cutters, is bolted solidly to the bed. The housing that supports the work drum is slideable on the support and the work drum spindle can be adjusted within certain limits to give the desired radius. The work mandrel can be adjusted and brought nearer to the cutters if necessary. Therefore, the radius from the center of the work mandrel to the center of the cutters is changeable. The work drum or fixture is located on a mandrel 22 in. in diameter.

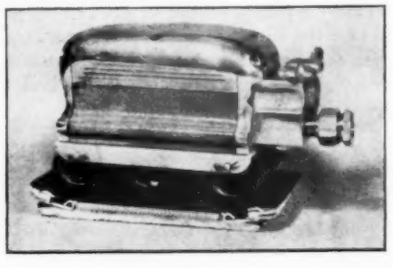
The right-hand milling head with its outboard support for the outer end of the work mandrel is adjustable on the bed. Adjustment is made through a large screw on the base of the machine, and another on the overarm support.

Drive to the spindles is through a worm and worm gear. The finishing spindles have spherical bearings and these spherical bearings are located in sleeves. The sleeves in turn are fitted to the main frame of the machine. When the spindles are to be adjusted endwise, it is accomplished by a large geared nut on the end.

Any wear in the drive of the work mandrel can be taken up. The mandrel has a large worm wheel bolted thereto and is driven at the bottom by a worm from a motor at the back. The horizontal worm by means of bevel gears drives a second worm, disposed at an angle of 45 deg. The worm at an angle is provided with vernier adjustment so that any wear can be taken up during the life of the machine.

"Speed-Bloc" Oscillating Sanding Machine

The "Speed-Bloc" sander, designed to replace hand sanding and rubbing, has been designed by Sterling Products Co., Curtis Bldg., Detroit, Mich. The improved design has made the sander applicable to more curved, and to all flat, surfaces. It may be used on metal, fabric, wood, or composition. Flexible tubular rollers of special rubber composition between the pad and the air motor replace the conventional bridge construction, increasing contact of the abrasive surface by about 90 per cent. A hardened steel shoe, which receives the thrust, is now vulcanized integrally with the rubber block instead of being held by screws as heretofore. Full operation is accomplished with 50 to 60 lb. air pressure instead of 70 lb. and air comsumption is slightly over 6 cu.ft. per min. The oscillating stroke of the pad is $\frac{5}{8}$ in., and the speed remains at 3,000 strokes per min. The unit is 7 in. long, $4\frac{3}{4}$ in. high, and $3\frac{3}{4}$ in. wide and weighs $7\frac{1}{2}$ lb.



Brown & Sharpe No. 00G Automatic Screw Machine

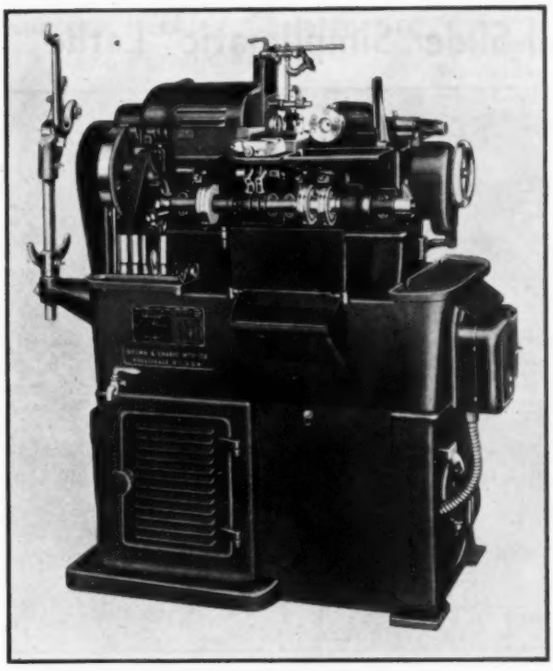
Several major changes in design, and numerous minor structural changes, have been made by the Brown & Sharpe Mfg. Co., Providence, R. I., in the No. 00G high-speed, motor-driven automatic screw machine, to increase its productive capacity. Previously, machining limitations of the stock used, or limitations of the machine itself, often necessitated handling the job on another size machine where the correct surface speeds could be obtained. On this machine it is now possible quickly to obtain the correct speeds for any job up to 3/8 in. diameter, or 1/2 in. diameter on light work, on either hard steel, free cutting steel, brass or any of the freer-cutting materials.

The maximum spindle speed has been increased by 20 per cent. Thirty-six changes in spindle speed are available, the range extending from a new low speed of 200 r.p.m. to the maximum of 6,000 r.p.m. Changes can be made easier and quicker, and to assist the operator in making changes in both speeds and feeds, metal plates with diagrams and charts of the spindle speed change, feed change mechanisms and obtainable gear combinations are mounted on the machine.

An increase in capacity of the work spindle by 20 per cent on work up to 3/8 in. diameter has been made. This, with the increased spindle speeds, provides for handling those borderline jobs which formerly required a large size machine. With the aid of a larger size feed tube light work up to 1/2 in. diameter can be accommodated. Light work in this connection refers to those parts not requiring heavy operations which can be produced at full machine capacity from the free cutting materials such as aluminum, brass, compositions and celluloid.

The regular feed tube furnished with the machine accommodates a No. 10 feeding finger which is stocked in sizes up to and including 3/8 in. round. When the 1/2 in. capacity feed tube is used on material larger in diameter than 3/8 in. round, a No. 10A feeding finger is available in the following sizes: 33/64 in., 7/16 in., 29/64 in., and 1/2 in. round; and 3/8 in. and 7/16 in. hexagonal. To permit the use of No. 00 spring collets and feeding fingers, an extra nut, sleeve and adapter are furnished as part of the regular equipment of the machine for use in connection with the 3/8-in. capacity feed tube.

The No. 00G Machine is also available in simplified form for work not requiring all the functions of the full automatic.



Brown & Sharpe No. 00G automatic screw machine of increased capacity has 36 spindle speeds from 200 to 6,000 r.p.m.

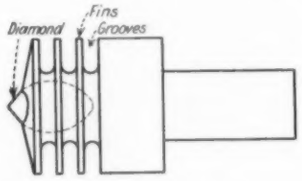
Harnischfeger "Zip-Lift" Light Hoist

A line of electric hoists, known as the "Zip-Lifts," with capacity ratings from 250 to 500 lb., is announced by the Harnischfeger Corp., 4400 West National Ave., Milwaukee, Wis. Designed primarily for "spot handling" work in machine shops, welderies, storage booths and foundries, these units are of all-welded construction, the quarter-ton model weighing only 100 lb. With a ball-bearing motor designed for hoisting service and smooth operation through a simplified planetary gear train, which is fully inclosed and running in oil, the hoists have hoisting speeds up to 32 ft. per min., and are controlled either by push button or pendant rope. All complicated wiring has been eliminated so that for hook, trolley or jib crane service they need only be hooked up and plugged in. Safety is assured with weight-type limit switch, solenoid dry disk motor brake and ratchet and roller type mechanical brake. Standard units are furnished with or without trolley.

"Zip-Lift" designed for "spot-handling" work in shops

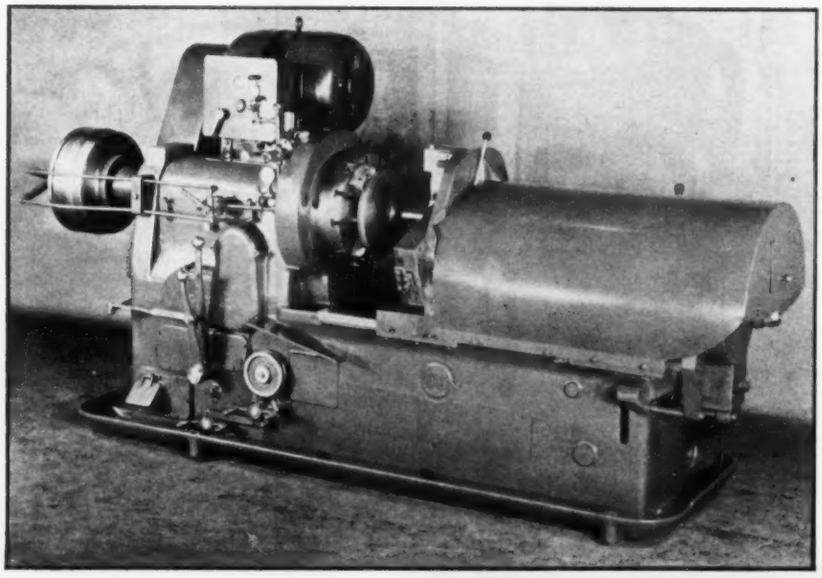
Gilmore Finned Diamond Wheel Dresser

A diamond wheel dresser designed with annular grooves separated by thin fins, has been produced by F. F. Gilmore & Co., 112 Dartmouth St., Boston, Mass. The grooves carry the water close enough to cool the diamond, and the fins, surrounded by the coolant,



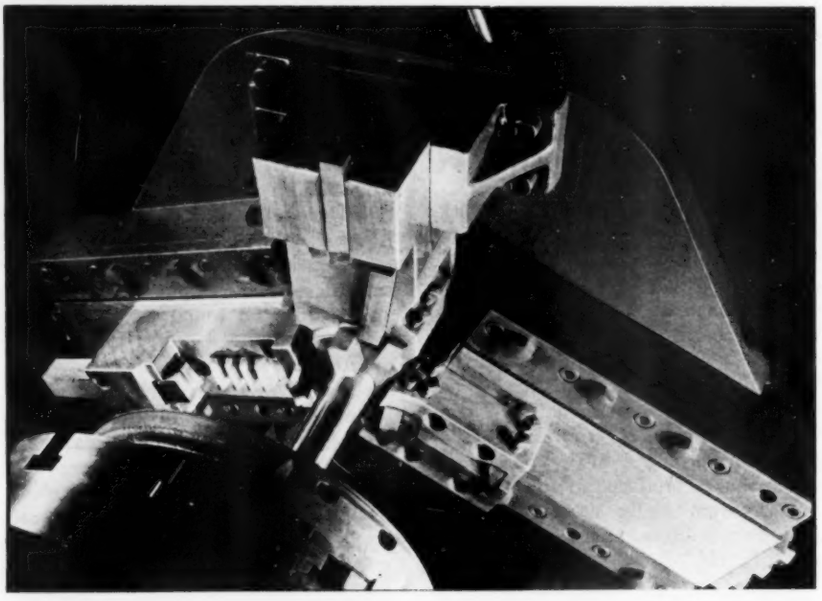
tend quickly to dissipate the frictional heat generated by the wheel. The prompt cooling action reduces the repeated expansions and contractions of the diamond, preventing minute flaws in the gem which usually extend into serious fractures. The cooling effect of the grooves and fins maintains a more even temperature of the wheel dresser and prolongs the life of the diamond.

Gisholt Radial-Slide "Simplimatic" Lathe



Left — Gisholt "Simplimatic" used to machine Plymouth flywheels

Below — Tools in the three radial slides and a boring spindle in the center are used in this set up



An application of the Gisholt "Simplimatic" completely machines Plymouth flywheels in two operations. The battery of two Gisholt radial-slide "Simplimatic" lathes replaces three obsolete machines and increases the production from 18 to 44 per hour, floor to floor time. The flywheels are held to close tolerances and only one operator is required to tend the two machines, developed by the Gisholt Machine Co., Madison, Wis.

A special tool carriage, with a vertical face on which the tool slides are mounted radially to the work, supplants the old, conventional flat-table principle which uses only one plane for cutting. This carriage brings the tool slides up close to the work and permits the tools to be presented to the working surfaces without any interference or overhang. A single drum-type master-cam actuates the slides. Hardened steel cam segments are bolted on the master cam to control the movement of each tool slide, providing a versatile machine because the cam segments can be changed when needed to provide different feeds or timing of the respective slides when tooling up for another job.

The machining cycle is entirely automatic. The operator moves one lever to complete the whole operation. The carriage or master slide holding the tool blocks is rapidly traversed to within ¼ in. of the work by an air cylinder. A drum-type cam then continues the feeding of the tools to the required depth. The tooling on both machines is generally similar and includes a central boring and turning slide feeding longitudinally, and two radially disposed slides having traverse feeds for facing, recessing, forming and chamfering. At the completion of the cut, the slides automatically return to the starting position and the master slide is quickly traversed back to the starting position, the spindle is automatically stopped, leaving the machine ready for immediate removal of the finished piece and for reloading.

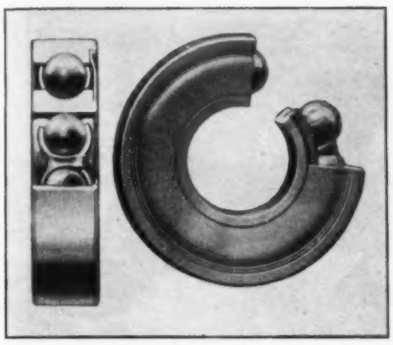
Tungsten carbide and Stellite-J metal tools are used in these roughing operations, removing approximately $\frac{5}{32}$ in. stock. The cutting speed is approximately 200 ft. per min., which is dropped down to 100 ft. per min. for the final shaving operation. The feed is about 0.030 in. per revolution and results in an excellent tool life between grindings.

The work on each machine is held in a three-jaw air-operated chuck. A 16-in. cylinder for the air chuck is required to hold the work securely in place. Complete automatic lubrication is provided for every important bearing and working surface. The carriage ways and individual tool-slide ways are oiled from a central reservoir by force-feed lubrication.

Fafnir Grease-Shield Ball Bearings

Grease-shield ball bearings are being supplied in an increased range of sizes by the Fafnir Bearing Co., New Britain, Conn. These bearings are equipped with single or double metal side-shields to retain the lubricant and to exclude dirt and foreign matter. For moderate service, these self-contained shields simplify housing design. In more severe service, they supplement additional covers and grease baffles, and protect the bearing.

In the single-shield Type D design, a steel stamping is fastened securely to the bearing outer ring on one side,

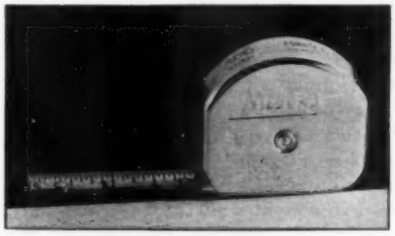


Fafnir grease shield bearing excludes dirt

protruding into a rabbet on the end of the inner ring with only a few thousandths of an inch clearance. The shield does not project beyond the bearing. In single row bearings, the shield is introduced without increasing the normal bearing width, and is interchangeable with standard units. They are available in more than 50 sizes, with bores from 4 to 110 mm., and outside diameters from 16 to 225 mm. Twenty sizes of the double-row "single-shield" variety may be had. The "double-shield" Type DD bearings, retain the lubricant in the bearing for longer periods under difficult service conditions. Bores range from 6 to 100 mm., and outside diameters from 19 to 215 mm.

Lufkin Square-Box Steel Tape-Rule

A 6-ft. steel tape, with a case having three flat edges to facilitate inside and outside measuring, has been designed by the Lufkin Rule Co., Saginaw, Mich. The box is 2 in. wide, and for inside measuring the square box is butted against one side of the opening to be measured. When the tape is extended to the limit, the user simply adds 2 in. to the reading. This

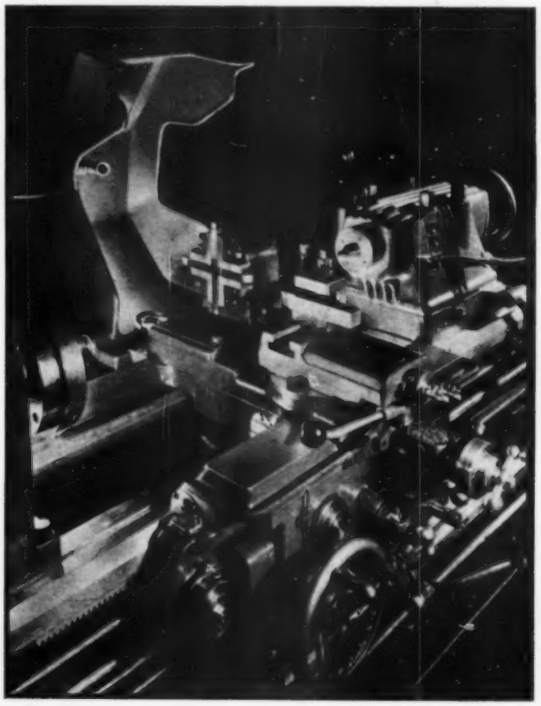


"Mezurall" tape-rule comes with an end hook. One model is marked on one side only, both edges, inches to sixteenths, with the first 6 in. of the upper edge to 32nds. The other model has markings on both sides of the blade. Available in metric units.

Monarch Necking, Chamfering and Forming Turret

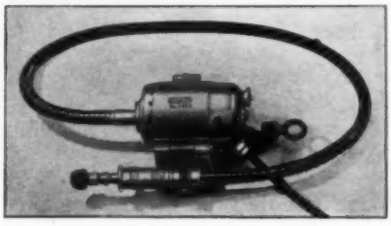
A rear necking, chamfering and forming turret for mounting on the back of a connected compound rest on an 18 in. Model "BB" shaft turning lathe, has been announced by the Monarch Machine Tool Co., Sidney, Ohio. The indexing lever for the necking turret is shown to the left of the compound rest at top of the carriage in a position most convenient for the operator.

To reduce the time of the necking, chamfering and forming operations on shaft work, the rear turret is operated from the front of the lathe. The turning tool, mounted in the front toolslide, is so arranged that, at the end of each length cut, the tools mounted in the rear necking turret are in the proper position for doing their work when the carriage is automatically stopped at the end of each length cut. When the operator runs the connected toolslide rest against the positive stop, the depth of necking, forming or chamfering cut is determined. The turret has been designed to save time in doing the work. A second operation is avoided. Turrets are arranged for either four or six tools. When set up for four tools, the turrets accommodate a ¾ in. square tool, and when arranged for six tools it accommodates a ⅜ in. square tool.



Stanley Flexible-Shaft Grinder

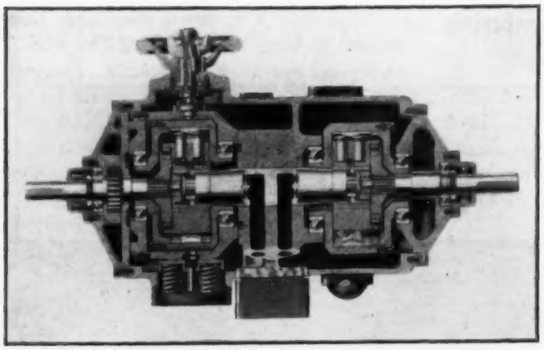
A flexible shaft, portable grinder that develops 3 hp., and a speed of 18,000 r.p.m., is now manufactured by the Stanley Electric Tool Division, Stanley Works, New Britain, Conn. This grinder is designed for external and internal grinding operations on tools, dies and castings. The universal motor provides ample power to drive a 1½ x ½-in. emery wheel and maintain a high grinding speed on the toughest work. The flexible shaft is 42 in. long and has a heavy rubber-reinforced casing with protection springs on each end. The handle piece is equipped with special ball bearings and a collet type chuck to hold ¼ inch shanks.

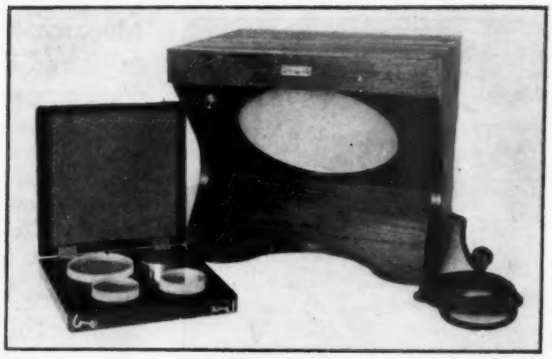


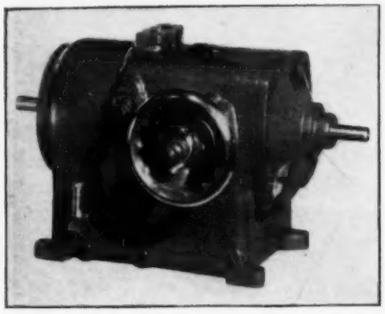
G.E. 250-Watt Mercury-Vapor Lamp

A 250-watt, high intensity mercury-vapor lamp has been announced by the General Electric Vapor Lamp Co., Hoboken, N. J. It has a tubular bulb and a standard screw-base socket. It has an efficiency of 25 to 30 lumens per watt, and works efficiently in vertical and horizontal positions. Its operating life is rated at 2,000 hours, and produces as much light as 425 watts in

incandescent lamps. It can be used alone or in combination with incadescent lamps, depending upon the lighting requirements. Specially designed reflectors for this lamp are available.







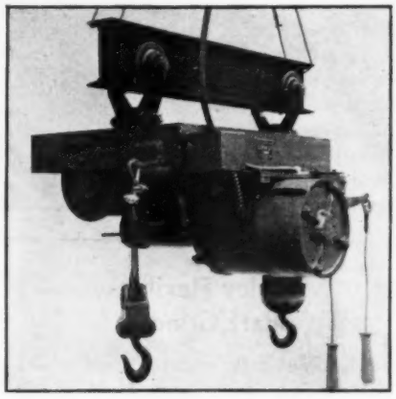
Left—Hand or automatically controlled "Oilgear" fluid-power variable-speed transmission of simplified construction. Right—At the top is the complete Van Keuren light-wave equipment, and just below is a view showing testing flat surfaces under monochromatic light source

"Oilgear" Fluid Variable-Speed Transmission

The "Oilgear" fluid power variable-speed transmission has been simplified by a redesign of input and output units, which eliminates thirteen parts from each piston, according to the Oilgear Co., 1319 Bruce St., Milwaukee, Wis. Increased capacities may be had with sharp reductions in size and cost. The friction and resistance-load on each piston is lessened and the intrinsic durability of this type of transmission is appreciably increased. The output end exerts 88 per cent torque efficiency at starting, and 97.6 per cent at 120 r.p.m. Output speed ranges steplessly from 5 to 1090 r.p.m. The transmission is available in sizes from 2 to 100 hp., and is controlled either by hand or by automatic direct and remote devices.

Electro Lift Twin-Hook Monorail Hoist

The twin hook monorail electric hoist built by Electro Lift, Inc., 30 Church St., New York, N. Y., is designed in capacities of ¼ to 3 tons and is used for long or bulky loads. The load, lifted from two points, is carried without twisting. Hoist cables are carried on two drums spaced to suit requirements, and are operated from a single shaft from the worm-geared hoist unit. The unit is carried on a compact and rigid welded steel frame. The worm drive runs on Timken tapered roller bearings, fully inclosed within the gear case in a bath of oil. Control may be either rope type or push-button type.



Van Keuren Light-Wave Equipment

A light-wave equipment with more accurate and better wearing optical flats and an improved monochromatic light has recently been put on the market by Van Keuren Co., 10 Copeland St., Watertown, Mass. It is suitable for testing flatness of commercial lapped flat surfaces or for making length or diameter measurements of precision gage blocks, plug gages, or steel balls.

The set consists of two 2-in. diameter by ⅝ in. thick, single surface, semi-quartz working flats of 0.000002 in. accuracy; one 2-in. diameter by ½-in. thick, double-surface steel working flat of similar accuracy, and one 3-in. diameter by ¾-in. thick, single-surface master flat of 0.000001 in. accuracy. These flats are twice the accuracy previously guaranteed, and the semi-quartz material from which the flats are made shows wearing qualities from three to four times greater than the optical glass of former equipments. The monochromatic light is an oak cabinet 12 in. wide by 11 in. deep by 11 in. high, with space inside to house a gas-filled tube similar to those used in neon signs with necessary transformer, switch and diffusing glass.

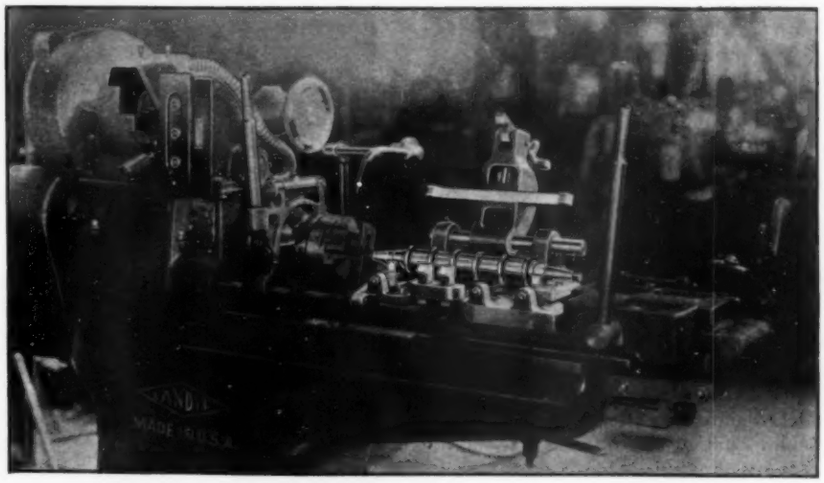
The light tube is 10½ in. over-all length with chemically treated electrodes and has a 4-in. coil to provide the necessary light and insure long life. It is filled with a special gas that emits a strongly monochromatic light of 11.6 millionths of an inch per dark interference band. The life of the tube is estimated to be from 1,000 to 2,000 hours continuous use. A 3,000-volt transformer operated from a 110 volt 60 cycle supply is used to give proper lighting of the tube. This is of small amperage so that it is not dangerous.

An important feature of the device is that the light emitted is so strongly monochromatic that the bands are clearly visible when the separation of surfaces is as much as 0.005 in. Thus, the optical flat need not touch the surface being tested. Bands are visible on comparatively dull surfaces such as are common on lapped soft steel or on burnished bronze or brass.

Landis Special Work-Holding Fixture

A work-holding fixture designed to maintain concentricity between both ends of a threaded part has been put on the market by the Landis Machine Co., Waynesboro, Pa., for use on its threading machines. A 7/8-in. hardened and ground "Lanco" head is used for cutting the threads. To obtain the close tolerances needed on the concentricity of a camshaft, for example, the shaft is held in V-grips made of hardened steel and gripped on the bearing surfaces at each end. It is clamped in position by a special self-aligning clamp. The fixture is attached to the carriage of the machine and can be adjusted to obtain the required alignments. The rear locating plate can be adjusted for different work lengths.

The design of the fixture is such that it may be adapted for holding other types of work requiring the threading of both ends in true alignment. It can be furnished for any size of Landis threading machine.



Landis work-holding fixture used for threading both ends of a diesel engine cam shaft

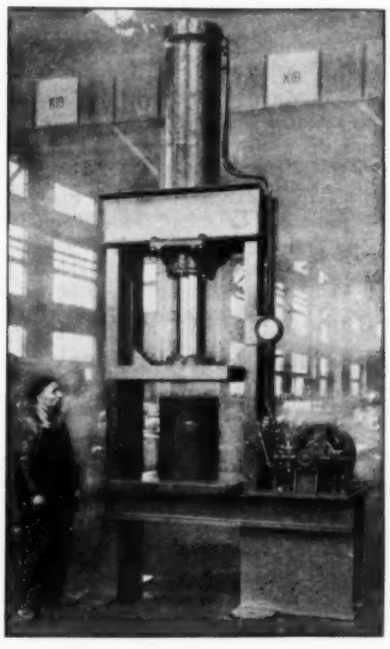
"Electro-Copyst" for Copying Drawings

An apparatus for copying photographs, drawings or printed material has been developed by the Electro-Copyst, Inc., 342 Madison Ave., New York, N. Y. The "Electro-Copyst" reproduces facsimile copies from transparent or opaque subjects. The apparatus is portable and simple in design and may be had in several sizes. Experience is not necessary for using the machine and it may be operated in office daylight without the use of a dark room. A container for sensitized paper and a time switch which automatically regulates and controls the length of exposure are built into the machine. The standard model copies work up to 15½ x 10 in. Copies may be made from larger originals.

Southwark 75-Ton Utility Press

A 75-ton "moving down" type press recently designed by the Baldwin-Southwark Corp., Philadelphia, Pa., forces bushings in or out, bends, straightens, presses and forms small parts. When the occasion demands, it can be adapted to production operations.

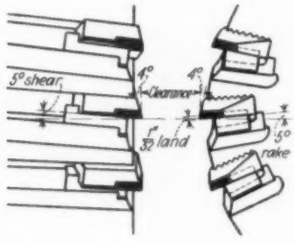
Movement of the ram is controlled by a single valve lever. This lever starts and stops the machine, holds the ram in any desired position, and regulates the speed. The press has a welded structural steel frame with heavy steel platens. The bottom platen has a hole in its center under the ram for forcing out pieces. Cast steel is used in the cylinder and the double-acting ram is cast iron.



Hydraulic pressure is furnished by a rotary, motor driven, hydraulic pump mounted on the end of the bed, above the oil tank. A gage in view of the operator shows the pressure attained, and overloading is prevented by a safety valve.

Ingersoll Cemented-Carbide Cutters

A "Zee-Lock" milling cutter, to meet the exacting requirements of cemented carbide, has been developed by the Ingersoll Milling Machine Co., Rockford, Ill. The cutter blade is tipped with cemented carbide and inserted into a forged and case-hardened alloy steel cutter body. The Z-shaped wedge securely retains the serrated cutter blade in the cutter housing. The wedge hooks the back of the blade and the front of the cutter body, preventing the blade from shifting backwards or inwards from the cut. The back hook of the wedge is on a slant so that when the cutter blade is reinserted and moved out a serration, it automatically moves forward a slight amount, compensating for the slight amount of face wear. No additional parts or shims are required for resetting.

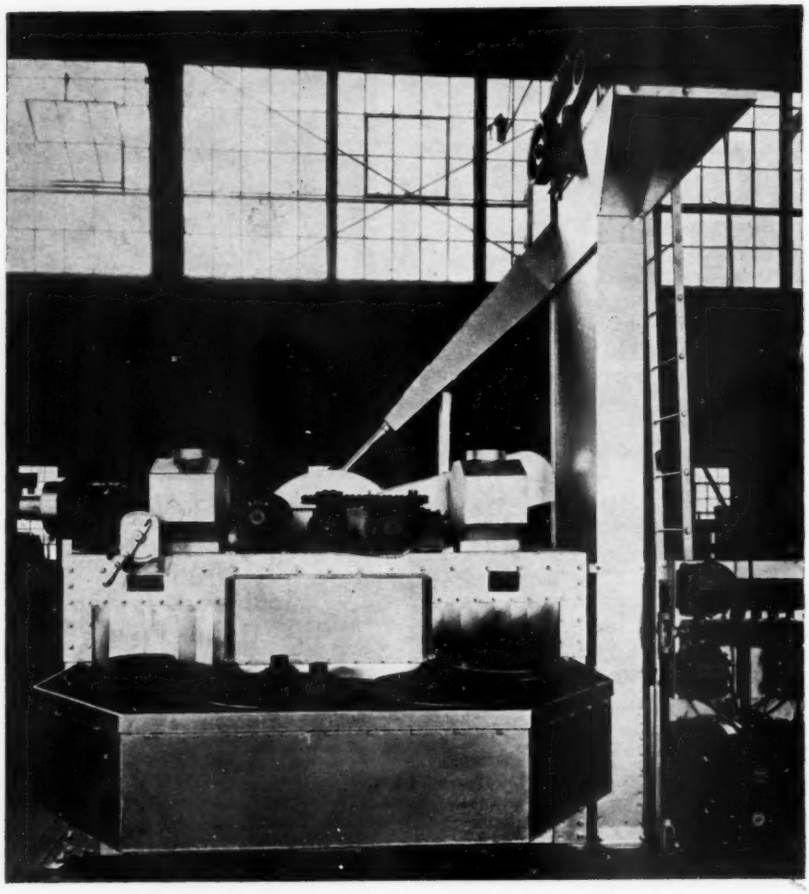


American Wheelabrator Multi-Rotary Table

The "Wheelabrator" multi-rotary table announced by the American Foundry Equipment Co., 555 Byrkit St., Mishawaka, Ind., consists of a number of independent tables. A guide under the center of each table runs in a track in a straight line for about 6 ft. directly under the equipment. This guides the tables under the blast so that the work will obtain the full effective blasting range of the abrasive as it leaves the wheel.

The vertical side of the table contacts a moving belt which revolves the tables as they pass under the blast. The speed of this belt is variable, as is the speed of turning the table. After traveling under the blast, the tables follow the track out of the cabinet where the material can be removed or turned over for a second application.

Abrasives are loaded in an overhead hopper. They are fed through a chute and control gate to the center of the wheel. The abrasive is thrown by centrifugal force from the blades of the wheel on the work to be cleaned. The abrasive is controlled as to volume and direction of blast so that any type of cleaning and preparation can be accomplished, from light metal parts requiring a satin finish to heavy castings or forgings needing dirt or scale removed. Spent abrasive, after being thrown from the wheel on the parts to be cleaned, fall into a hopper, which feeds to a screw conveyor. It delivers the abrasive into an elevator and is taken to the overhead hopper for reuse. Fragile pieces can be cleaned.



Castings ranging from fragile parts to be satin-finished to heavy parts requiring scale removal can be cleaned with the "Wheelabrator" and multi-table rotary equipment

Sulflo Cutting Oil

Recent improvements in Sulflo, made by the Sulflo Corp. of America, 701 Spring St., Elizabeth, N. J., are said to have increased the effectiveness of this cutting lubricant. Chief characteristic of this product is that it contains a stable suspension of finely divided sulphur; tests show that this permits higher cutting speeds and heavier feeds.

The lubricating value of sulphur is attributed in part to its increase in viscosity with a rise in temperature. High temperatures and pressures, such as exist at the point of a cutting tool, tend to break down an oil film. It is claimed for Sulflo that the viscous molten sulphur supplies fluid film lubrication in addition to the chemical contamination film effect found in sulphurized oils.

Sulflo is odorless, non-corrosive and without detrimental effect on the skin; it contains no fatty acids and will not gum. It is supplied in a variety of concentrations designed for specific cutting conditions as recommended by the maker. Sulflo No. 5, containing 15 per cent of sulphur, is intended to be diluted with two parts of petroleum oil.

In addition to increasing production it is claimed that the use of Sulflo will produce a better finish and longer tool life. These qualities are said to be especially effective on difficult machining jobs such as stainless steels, monel metal and tough bronzes.

Dumore No. 44 "Toolmaker" Small Lathe Grinder

A small lathe grinder for internal and external grinding, has been developed by the Dumore Co., Racine, Wis. Equipped with a motor that develops ¼-hp., the No. 44 "Toolmaker" provides a spindle speed from 7,000 to 44,000 r.p.m. Ball-bearing equipped, the motor has forced ventilation. The motor is mounted pivotally, and has a simple belt adjustment. The shaft provides a ⅜-in. arbor for both the wheel and pulley. Spindle is mounted in ball bearings. The "Toolmaker" can be used on lathes with as little as an 8-in. swing, and a removable mounting post makes quick set-ups possible. Each grinder comes with three mounted wheels of assorted sizes, two fabric belts, five pulleys, and wrenches.

The Round Table

GAGING GAGES

"Sorry to hear you had trouble with that pump rotor that went to Dallas, Al. Who was to blame? I thought you felt Jack Haynes was a good man."

"So he is, Ed, to answer your last question first. He's a mighty good man —wish we had more like him."

"But didn't he inspect that rotor and give it his O.K. before it was shipped?"

"Sure he did, Ed. That's his job."

"You're funny, Al. You admit he's to blame for the mistake, yet you say he's good."

"You're wrong on one count, Ed. He wasn't to blame; the gages were at fault. We've kept using them without realizing that gages wear as well as pieces of machinery."

"I can't believe that there's wear enough on gages to make all the difference between a good rotor and a bad one. Why our gages have been in use for years and they're still O.K."

"I wonder if they are, Ed. A lot of shops kid themselves on their gages. I've checked a lot of gages and mikes that have been way off. I bet that many of your gages are worn at least several thousandths, perhaps more. Maybe your tolerances are wide enough so it doesn't matter."

"Well, how are you going to stop this happening again—and with other parts?"

"I've got to have my gages checked regularly, Ed. I see no other way. The problem is how to check them."

"Master gages ought to do the trick."

"Master gages cost money, Ed, perhaps more than you guess. But that isn't all. You have to know how to use them and even master gages wear.

"I've about decided to have the gages checked at regular intervals by some good testing laboratory. They have all the instruments for measuring the actual distances without even depending on the accuracy of master gages."

"I don't like the idea of sending the gages out of the shop. And I don't see how you know whether they measure them right or not."

"I don't exactly like sending them out myself, Ed. But it's being done, and express service is very reliable. These laboratories give you a signed statement of what they find and you can depend on them. I might even use the Bureau of Standards in Washington. They have the best of measuring machines."

Should gages be inspected regularly as Al suggests? Is a shop check sufficient or should they go to an outside testing laboratory?

DISCUSSION

Going To Townsend

The theory of the Townsend plan is that it will create new jobs through increased buying by the old folks, and employ young people to take the jobs now held by the old timers. Of the 10,000,000 eligible only about 1,000,000 hold jobs which would be filled by young people. The rest do not work or fill jobs created for them.

Suppose through increased buying by the Townsendites 10,000,000 of the present unemployed were given jobs, which they claim will happen. The average yearly income of wage earners is $1,000. See table below.

A scheme that cut the workers' net earnings almost in half hardly seems conducive to prosperity. Perpetual motion schemes have never worked because it is impossible to create something out of nothing, and it is equally impossible to create $24,000,000,000 a year by waving a fountain pen over a Townsend Plan petition.

—Bernard Shereff,
American Hard Rubber Company.

	After Townsend	Now
Workers under 60	59 million	48 million
Workers over 60	.....	1 million
Total workers	59 million	49 million
Income at $1,000 per year	59 billion	49 billion
Present taxes	6 billion	6 billion
Townsend taxes	24 billion	.....
Net worker's income	29 billion	43 billion
Average per worker	$490.00	$875.00

Black List

The opportunity for advancement for the average mechanic in any particular shop is usually limited to achieving the highest wages paid in that shop for his particular craft. Naturally, he then looks to other shops and other industries in which he may obtain higher rates for the higher grade of work for which he feels he has expanded his abilities. An employers' agreement that prohibits men from transferring from one local shop to another is not only unfair to the men, but is harmful to the employer in the long run. Employees cannot be kept in ignorance of such agreements and their attitude toward management is naturally affected.

It is true that in some localities certain shops offer more attractive rates and acquire a reputation for stealing local talent, but investigation will invariably show that for the higher rate they require greater skill. Hence, only the best men from the other shops can qualify. An employer should be given the opportunity to match the higher rate offered, but if he is unable to do so he should certainly raise no barrier to his employees' progress.

—G. Coombs.

By agreeing not to hire workers from other plants, it may be possible for each plant to keep a few men who might otherwise have been hired away. Also it may be possible to keep some men at a lower wage than competitors consider the fair value of the work they are doing, but either of these conditions is small compensation for stirring up hard feelings and building up a fighting labor organization.

There is nothing that will stir up trouble so quickly as a feeling among workers that they are bound to their jobs; in other words, that they are slaves. If the desirable employee is content with his position and is not looking for something better, he soon loses interest. We should hope that our employees would look for advancement in our own plants, but we must face the fact that a large percentage do not. They are ready to work and acquire skill so that when the chance arrives they can readily get jobs elsewhere.

Close this route of advancement, the only one that these particular workmen see, and they will seek another. Denied the route which they would naturally follow on their own initiative, they turn to the labor union. They may have joined the union because they looked upon it as a good thing generally, but now the union takes on a new aspect. It is the means to satisfy their ambition and they become fighting members.

—A. W. Forbes,
Forbes & Myers.

Open House

It is the general belief that without a toolcrib attendant there can be no control over small tools.

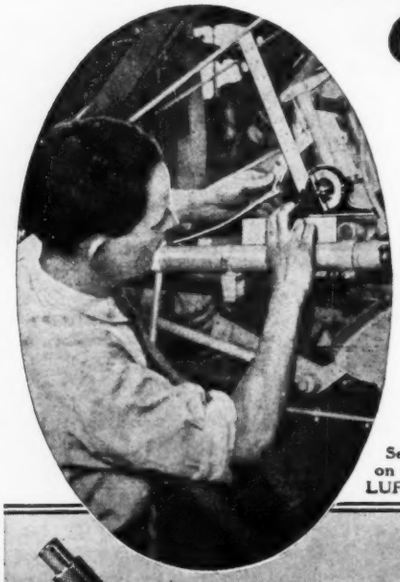
However, the small shop having an alert foreman and centralized racks having specific compartments for each tool will go a long way toward doing without an attendant. If ordinary shelves are used for the tools, the milling cutters may be found where the drills belong and the men may have to hunt for the lathe dogs.

Locating the responsibility for damaged tools is a troublesome problem to the management of a shop without a toolcrib attendant. I have found that the really skilled workmen and those who pay reasonably strict attention to their tasks damage the least number

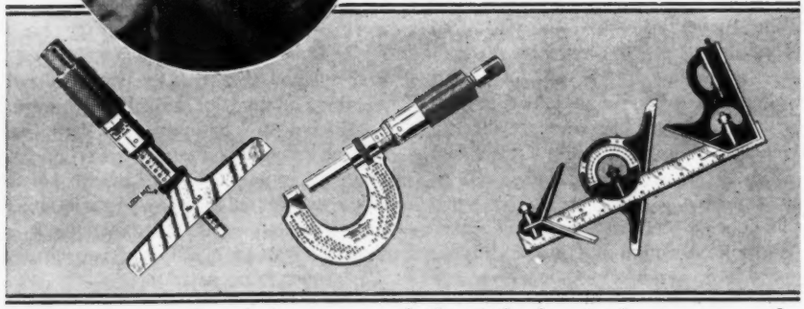
LUFKIN
TAPES - RULES - PRECISION TOOLS

The Skilled Craftsman USES LUFKIN PRECISION TOOLS

Standard of Accuracy



Setting rudder pedal on airplane with LUFKIN Bevel Protractor.



Accuracy is of great importance whether it be for simple patterns or the most intricate machinery.

LUFKIN PRECISION TOOLS carry every refinement and improvement so that they will suit perfectly the technical work for which they are intended.

Catalog sent on request.

FOR PRECISION WORK USE LUFKIN PRECISION TOOLS

NEW YORK: 106-110 Lafayette St.

THE LUFKIN RULE CO.
SAGINAW, MICHIGAN, U. S. A.

Canadian Factory WINDSOR, ONT.

of tools. When damage occurs to tools in their possession they do not hesitate to assume the responsibility.

Accurate inventories of small tools can be used as a guide toward more efficient purchasing, thereby helping to avoid the constant running out of certain tools, which results in needless delay and expense.

—PETER L. BUDWITZ.

This question is not one that has a universal answer, inasmuch as shop conditions themselves enter into it 100 per cent.

One can readily see that in the smaller shop where the majority of the men are all-around machinists, and where labor turnover is at the minimum, that the expense of an attendant for the toolcrib would not be warranted. On the other hand, in the large, high-speed production shops where the majority of the men are merely operators, and where labor turnover is fairly large, their trustworthiness is an unanswered question. Without a toolcrib attendant, how could the management ever know whether the tools were being legitimately worn out, abused or stolen?

Worst of all evils is the man who grinds the tools he uses by the hit and miss method, grinding them badly or grinding off more than is necessary.

As to the importance of an accurate inventory of small tools, a check-up was made in one shop that had no toolcrib attendant. Every operator was required to turn in all company tools in his possession. It was found that 31 items had been recently purchased for which there was really no need, as there was an actual oversupply when all tools had been turned in. Some of these tools had been kept in the operators' pockets or in their personal tool chests and were used for "government" work.

—CHAS. R. WHITEHOUSE,
Electrical Engineer,
Walthan Watch Company.

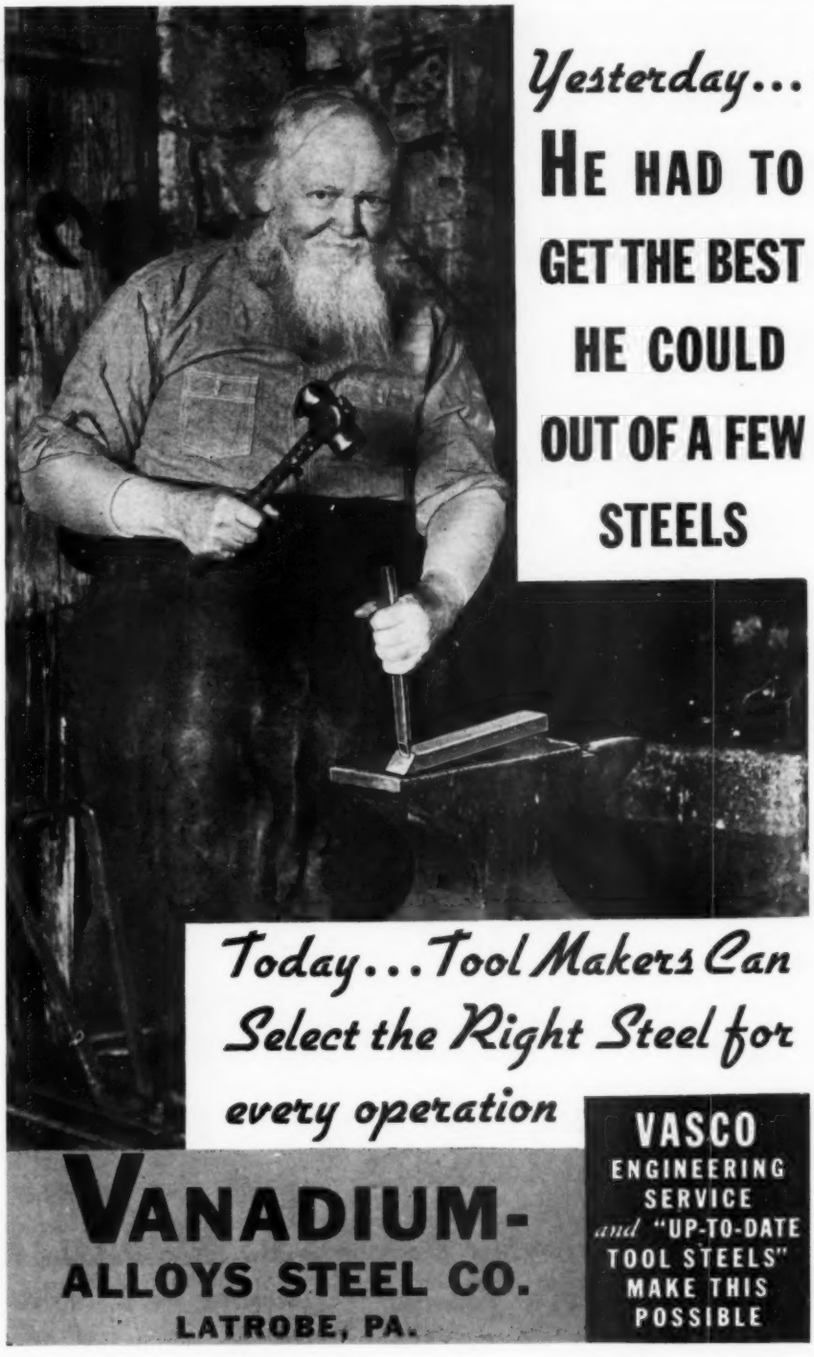
When Al says he is getting tired of system, I think he is well on the downward road. Most of us in similar positions as Al's have a long time ago awakened to the financial value of system. While Al's opinion of his men is praiseworthy, he is obviously easily taken in.

The present writer has supervised machine and fitting shops for more than 50 years and is compelled from bedrock experience to record a veto against any concern, even the smallest, neglecting to provide a definite control of the toolcrib. In regard to an accurate inventory of the tools, it is considered an absolute necessity.

Men like Al and Ed well know that in the absence of an inventory all is veritable chaos because not only the workmen do not know what tools the concern possesses, but the concern itself does not know. And how is it possible to bid on work without a knowledge of what tools are available? Without an inventory of small tools, time will be wasted in muddling through a job by antiquated methods, while all the time there may be a tool in the toolcrib especially suited to the job. On the other hand, the workman will leave his job, go to the toolcrib seeking a tool and the toolcrib attendant will waste time in looking for a tool that's not there.

—J. T. TOWLSON,
Enfield, Middlesex, England.

The need of a toolcrib attendant in the small shop depends upon the nature of the work and the type of workmen employed. Some small produc-

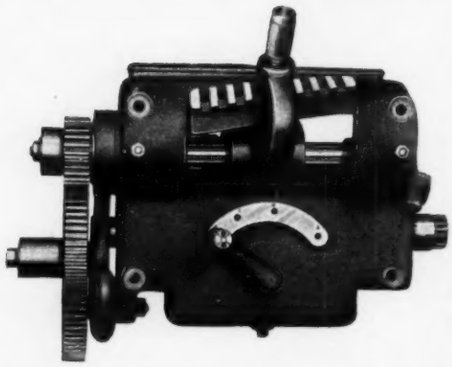

Yesterday...
HE HAD TO GET THE BEST HE COULD OUT OF A FEW STEELS
Today...Tool Makers Can Select the Right Steel for every operation
VANADIUM-ALLOYS STEEL CO.
LATROBE, PA.
VASCO ENGINEERING SERVICE and "UP-TO-DATE TOOL STEELS" MAKE THIS POSSIBLE

tion shops doing repetitive work only will need no attendant for the toolcrib, since each man can be held responsible for the storage and care of the tools used in his particular operations.

Strange as it may seem, the small shop employing skilled toolmakers needs a check system for tools more than does any other kind of shop. I have found that many toolmakers will hide tools for their own use, keeping them locked in their own tool chests.

I once worked in a small shop that handled this matter quite well. A room at the front of the building was inclosed with wire netting. Two large angle-iron racks were used for tool storage, and the remainder of the room served as a shipping and receiving department and a stockroom. The attendant was a young man recently out of high school. He did all of the receiving and shipping, as well as issuing the tools on check. I think many small shops will find it profitable to adopt some such arrangement. However, the other duties of the toolcrib attendant should not interfere with the prompt delivery of tools to waiting workmen. —HERBERT M. DARLING, *Superintendent, Wells Tool Company.*

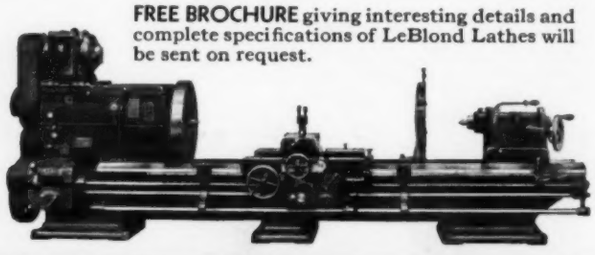
LE BLOND LATHES
give every shop many sharp
Production Economies



THE acid test of any equipment is performance. This quality is inherent in every LeBlond Lathe, the result of a half century devotion to the ideals of superior design and extra value.

In every feature of the LeBlond lathe Performance is self evident. The Feed Box, for instance. It is of extra heavy design with a range of feeds for all requirements without the use of pick off gears. A cone of gears, an intermediate shaft on anti-friction bearings and a set of sliding gears are housed in a one piece casting. Tumbler gear is held in positive engagement with cone gears by means of plunger in shifter handle. This insures smooth drive to lead screw, thus producing accurate threads and smooth cutting.

FREE BROCHURE giving interesting details and complete specifications of LeBlond Lathes will be sent on request.



The R. K. LE BLOND
MACHINE TOOL CO., CINCINNATI, O.
HALF CENTURY OF SERVICE TO INDUSTRY

Praise in Public

I am heartily in accord with Al's method, because a word of appreciation judiciously given to men within hearing of their shopmates is a very effective stimulant of out-put. However, where it is necessary to speak firmly to anyone, he alone should get the benefit of it. A man does not resent a deserved calling down, but he does resent it being heard by others.

A man's sense of responsibility will be increased by calling his attention to the actual money value of a mistake he has made, and some plants have been able to decrease the amount of spoiled work by recording and issuing to their men a detailed cost of their mistakes. There is nothing that impresses a workman more strongly than to have his attention called to the cost of a mistake in money value. A simple statement of the figures will have more effect than other criticism.

A works superintendent remarked during my foremanship, "Don't be afraid to say a good word to your men occasionally. There is enough indifference and enough callowness in the world. After all, is not more satisfaction to be gained from running a business harmoniously by giving a word of appreciation and a word of praise to men than by attempting aggressiveness to get results?" —A. EYLES, *St. Albans, Hertfordshire, England.*

Ed is up the pole when he says that men don't mind other people getting medals. As each man thinks he ought to have a jeweler's shop full of such trinkets, he mostly gets hurt because he thinks the other fellow got something that did not belong to him. Competition can not compete with jealousy.

And when Ed thinks that men are so like elephants that he can't get through their hides he pulls another boner. No man is going to show that the fleas bit him when the crowd is ready to laugh. But if Ed gets a stone through his window, he can blame it on men's skins being thinner than he knows. —M. P. DALTON, *Dublin, Ireland.*